

# Distributed Routing Software

---

## Network Interface Operations Guide

Part Number: AA-QL2BC-TE

**January 1996**

This manual provides information about configuring and monitoring the network interfaces in the Distributed Routing Software bridging router.

**Revision/Update Information:** This is a revised manual.

**Software Version:** Distributed Routing Software V1.1

Digital Equipment Corporation makes no representations that the use of its products in the manner described in this publication will not infringe on existing or future patent rights, nor do the descriptions contained in this publication imply the granting of licenses to make, use, or sell equipment or software in accordance with the description.

Possession, use, or copying of the software described in this publication is authorized only pursuant to a valid written license from Digital or an authorized sublicensor.

© Digital Equipment Corporation 1996  
All Rights Reserved.  
Printed in U.S.A.

The following are trademarks of Digital Equipment Corporation: DEC, DECnet, OpenVMS, PATHWORKS, ThinWire, VAX, VAXcluster, VMS, VT, and the DIGITAL logo.

The following are third-party trademarks:

AppleTalk is a registered trademark of Apple Computer, Inc.

Intel is a trademark of Intel Corporation.

IBM is a registered trademark of International Business Machines Corporation.

MS-DOS is a registered trademark of Microsoft Corporation.

NetWare and Novell are registered trademarks of Novell, Inc.

Proteon, ProNET, and TokenVIEW are registered trademarks of Proteon, Inc.

UNIX is a registered trademark in the United States and other countries, licensed exclusively through X/Open Company Ltd.

This manual was produced by Shared Engineering Services.

---

# Contents

## Preface

### 1 Getting Started with Network Interfaces

|  |     |
|--|-----|
| Network Interfaces and the GWCON Interface Command .....             | 1-1 |
| Accessing Network Interface Configuration Processes .....            | 1-1 |
| Accessing Network Interface Console Processes .....                  | 1-2 |
| Accessing Link Layer Protocol Configuration and Console Processes .. | 1-2 |

### 2 Configuring the Ethernet Network Interface

|                                       |     |
|---------------------------------------|-----|
| Ethernet Configuration Commands ..... | 2-1 |
|---------------------------------------|-----|

### 3 Monitoring the Ethernet Network Interface

|  |     |
|--|-----|
| Displaying Ethernet Statistics through the Interface Command ..... | 3-1 |
| Accessing the Interface Console Process .....                      | 3-5 |
| Ethernet Interface Console Commands .....                          | 3-5 |

### 4 Configuring the FDDI Network Interface

|  |     |
|--|-----|
| Accessing the Interface Configuration Processes .....    | 4-1 |
| Network Interfaces and the GWCON Interface Command ..... | 4-1 |
| Basic FDDI Configuration Procedures .....                | 4-1 |

|          |  |      |
|----------|--|------|
|          | FDDI Configuration Commands .....  | 4-2  |
| <b>5</b> | <b>Monitoring the FDDI Network Interface</b>                             |      |
|          | FDDI Interfaces and the GWCON Interface Command .....                    | 5-1  |
|          | Statistics Displayed For the FDDI Interface .....                        | 5-1  |
| <b>6</b> | <b>Configuring the Frame Relay Interface</b>                             |      |
|          | Accessing the Frame Relay Configuration Environment .....                | 6-1  |
|          | Frame Relay Basic Configuration Procedure .....                          | 6-1  |
|          | Frame Relay Configuration Commands .....                                 | 6-2  |
|          | Enabling Frame Relay Management .....                                    | 6-3  |
| <b>7</b> | <b>Monitoring Frame Relay Interfaces</b>                                 |      |
|          | Accessing the Frame Relay Console Environment .....                      | 7-1  |
|          | Frame Relay Console Commands .....                                       | 7-1  |
|          | Frame Relay Interfaces and the GWCON Interface Command .....             | 7-7  |
|          | Statistics Displayed For Frame Relay Interfaces .....                    | 7-7  |
| <b>8</b> | <b>Configuring Point-to-Point Protocol Interfaces</b>                    |      |
|          | Accessing the Interface Configuration Process .....                      | 8-1  |
|          | Point-to-Point Configuration Commands .....                              | 8-1  |
| <b>9</b> | <b>Monitoring Point-to-Point Protocol Interfaces</b>                     |      |
|          | Accessing the Interface Console Process .....                            | 9-1  |
|          | Point-to-Point Console Commands .....                                    | 9-1  |
|          | Point-to-Point Protocol Interfaces and the GWCON Interface Command ..... | 9-20 |

## 10 Configuring Point-to-Point over Frame Relay Pseudo Interfaces

|  |      |
|--|------|
| Accessing the Interface Configuration Process .....  | 10-1 |
| Configuration Procedures .....                       | 10-1 |
| Adding a Frame Relay Interface .....                 | 10-2 |
| Adding PPP-FR Pseudo Interface .....                 | 10-2 |
| Configuring PPP-FR Pseudo Interface Parameters ..... | 10-2 |
| PPP-FR Configuration Commands .....                  | 10-3 |

## 11 Monitoring Point-to-Point over Frame Relay Pseudo Interfaces

|  |       |
|--|-------|
| Accessing the Interface Console Process .....                  | 11-1  |
| PPP-FR Console Commands .....                                  | 11-1  |
| PPP-FR Pseudo Interfaces and the GWCON Interface Command ..... | 11-21 |

## 12 Configuring the V.25 bis Network Interface

|   |      |
|---|------|
| Accessing the Interface Configuration Process .....     | 12-1 |
| Configuration Procedures .....                          | 12-1 |
| Adding a Network Address Name and Network Address ..... | 12-2 |
| Adding Dial Circuits .....                              | 12-2 |
| Configuring Dial Circuit Parameters .....               | 12-3 |
| Dial Circuit Configuration Commands .....               | 12-3 |
| V.25 bis Configuration Commands .....                   | 12-8 |

## 13 Monitoring the V.25 bis Network Interface

|  |      |
|--|------|
| Accessing the Interface Console Process .....              | 13-1 |
| V.25 bis Console Commands .....                            | 13-1 |
| V.25 bis and the GWCON Commands .....                      | 13-8 |
| Statistics for V.25 bis Interfaces and Dial Circuits ..... | 13-8 |

## 14 Configuring Serial Line Interfaces

|  |      |
|--|------|
| Accessing the Interface Configuration Process .....      | 14-1 |
| Network Interfaces and the GWCON Interface Command ..... | 14-1 |
| Serial Line Configuration Commands .....                 | 14-2 |

## 15 Monitoring Serial Line Interfaces

|   |      |
|---|------|
| Serial Interfaces and the GWCON Interface Command ..... | 15-1 |
| Statistics for the Serial Interfaces .....              | 15-1 |
| Serial Interface Line Interface Example .....           | 15-1 |
| RouteAbout Access EW Serial Line Interfaces .....       | 15-4 |

## 16 Configuring IEEE 802.5 Token-Ring Network Interfaces

|   |      |
|---|------|
| Accessing the Interface Configuration Process ..... | 16-1 |
| Token-Ring Configuration Commands .....             | 16-1 |

## 17 Monitoring IEEE 802.5 Token-Ring Network Interfaces

|   |       |
|---|-------|
| Accessing the Interface Console Process .....               | 17-1  |
| Token-Ring Interface Console Commands .....                 | 17-1  |
| LLC Monitoring Commands .....                               | 17-4  |
| Token-Ring Interfaces and the GWCON Interface Command ..... | 17-14 |
| Statistics Displayed for 802.5 Token-Ring Interfaces .....  | 17-14 |

## 18 Configuring the X.25 Network Interface

|   |      |
|---|------|
| Accessing the Interface Configuration Process ..... | 18-1 |
| Basic Configuration Procedures .....                | 18-1 |
| Addressing .....                                    | 18-3 |
| Setting the X.25 Node Address .....                 | 18-3 |
| Setting the National Personality .....              | 18-4 |
| X.25 Configuration Commands .....                   | 18-4 |

## 19 Monitoring the X.25 Network Interface

|   |      |
|---|------|
| Accessing the Interface Console Process .....                 | 19-1 |
| X.25 Console Commands .....                                   | 19-1 |
| X.25 Network Interfaces and the GWCON Interface Command ..... | 19-7 |
| Statistics Displayed for X.25 Interfaces .....                | 19-7 |

## 20 Configuring WAN Restoral

|  |      |
|--|------|
| Before You Begin .....                                 | 20-1 |
| Data-Link Layer Configuration .....                    | 20-2 |
| Configuration Procedure .....                          | 20-2 |
| Configuring the Router to Detect Failures Faster ..... | 20-3 |
| WAN Restoral Configuration Commands .....              | 20-3 |

## 21 Monitoring WAN Restoral

|   |      |
|---|------|
| Displaying the WAN Restoral Monitoring Prompt ..... | 21-1 |
| WAN Restoral Monitoring Commands .....              | 21-1 |
| WAN Restoral and GWCON Commands .....               | 21-7 |

## 22 Configuring ISDN Interfaces

|   |       |
|---|-------|
| Before You Begin .....                    | 22-1  |
| Configuration Procedures .....            | 22-1  |
| Adding Dial Circuits .....                | 22-2  |
| Configuring Dial Circuit Parameters ..... | 22-2  |
| Dial Circuit Configuration Commands ..... | 22-2  |
| Adding ISDN Addresses .....               | 22-8  |
| Configuring ISDN Parameters .....         | 22-8  |
| Optional ISDN Parameters .....            | 22-10 |
| ISDN Configuration Commands .....         | 22-11 |

## 23 Monitoring ISDN Interfaces

|   |      |
|---|------|
| Displaying the ISDN Monitoring Prompt ..... | 23-1 |
| ISDN Monitoring Commands .....              | 23-1 |
| ISDN and the GWCON Commands .....           | 23-7 |

## A X.25 National Personalities

### Index

### Tables

|      |   |      |
|------|---|------|
| 2-1  | Ethernet Configuration Command Summary .....          | 2-2  |
| 2-2  | NetWare IPX Encapsulation Types .....                 | 2-3  |
| 3-1  | Ethernet Console Command Summary .....                | 3-6  |
| 4-1  | FDDI Configuration Command Summary .....              | 4-2  |
| 4-2  | Frame Command NetWare IPX Encapsulation Types .....   | 4-3  |
| 4-3  | FDDI Port Connection Rules .....                      | 4-9  |
| 6-1  | Frame Relay Configuration Commands Summary .....      | 6-3  |
| 6-2  | Frame Relay Set Commands Options .....                | 6-4  |
| 6-3  | Protocol-address Prompts for the Add Command .....    | 6-6  |
| 6-4  | Protocol-address Prompts for the Remove Command ..... | 6-15 |
| 6-5  | Frame Relay Set Commands Options .....                | 6-18 |
| 7-1  | Frame Relay Console Commands Summary .....            | 7-1  |
| 8-1  | Point-to-Point Configuration Command Summary .....    | 8-2  |
| 9-1  | Point-to-Point Console Command Summary .....          | 9-1  |
| 10-1 | PPP-FR Configuration Command Summary .....            | 10-3 |
| 11-1 | PPP-FR Console Command Summary .....                  | 11-1 |
| 12-1 | Dial Circuit Configuration Commands Summary .....     | 12-3 |
| 12-2 | V.25 bis Configuration Commands Summary .....         | 12-8 |
| 13-1 | V.25 bis Console Command Summary .....                | 13-2 |
| 14-1 | Serial Configuration Command Summary .....            | 14-2 |
| 14-2 | Transmit Delay Values .....                           | 14-7 |



|      |   |       |
|------|---|-------|
| 15-1 | V.24 Circuits and States .....                      | 15-7  |
| 16-1 | Token-Ring Configuration Command Summary .....      | 16-2  |
| 16-2 | Frame Command NetWare IPX Encapsulation Types ..... | 16-3  |
| 17-1 | Token-Ring Console Command Summary .....            | 17-2  |
| 17-2 | Token-Ring Configuration Command Summary .....      | 17-4  |
| 18-1 | X.25 Configuration Commands Summary .....           | 18-5  |
| 19-1 | X.25 Console Command Summary .....                  | 19-2  |
| 20-1 | WAN Restoral Configuration Commands .....           | 20-3  |
| 21-1 | WAN Restoral Monitoring Commands .....              | 21-2  |
| 22-1 | Dial Circuit Configuration Commands Summary .....   | 22-3  |
| 22-2 | ISDN Configuration Commands .....                   | 22-11 |
| 23-1 | ISDN Monitoring Commands .....                      | 23-2  |



---

# Preface

## Objectives

This manual contains information about configuring and monitoring the network interfaces in your bridging router. More specifically, this guide enables you to

- Configure, monitor, and use the interfaces in the bridging router.
- Configure, monitor, and use the Link Layer software supported by the bridging router.

## Audience

This guide is intended for persons who install and operate computer networks. Although experience with computer networking hardware and software is helpful, you do not need programming experience to use the protocol software.

## Organization

This manual is organized as follows:

- Chapter 1 provides basic guidelines to follow when performing interface configuration and monitoring tasks. This chapter also describes how to display statistics for each configured interface.
- Chapter 2 describes the Ethernet configuration commands.
- Chapter 3 describes the Ethernet monitoring commands.
- Chapter 4 describes the FDDI configuration commands.

- Chapter 5 describes the FDDI monitoring commands
- Chapter 6 describes the Frame Relay configuration commands.
- Chapter 7 describes the Frame Relay monitoring commands.
- Chapter 8 describes the Point-to-Point configuration commands.
- Chapter 9 describes the Point-to-Point monitoring commands.
- Chapter 10 describes the Point-to-Point configuration commands over Frame Relay.
- Chapter 11 describes the Point-to-Point monitoring commands over Frame Relay.
- Chapter 12 describes how to configure a V.25*bis* interface.
- Chapter 13 describes the V.25*bis* console commands and GWCON commands.
- Chapter 14 describes the Serial Line Interface configuration commands.
- Chapter 15 describes the Serial Line Interface monitoring commands
- Chapter 16 describes the IEEE 802.5 Token ring configuration commands.
- Chapter 17 describes the IEEE 802.5 Token ring monitoring commands.
- Chapter 18 describes the X.25 Network Interface configuration commands.
- Chapter 19 describes the X.25 Network Interface monitoring commands.
- Chapter 20 describes the WAN-restoral configuration commands.
- Chapter 21 describes the WAN-restoral monitoring commands.
- Chapter 22 describes the ISDN configuration commands.
- Chapter 23 describes the ISDN monitoring commands.
- Appendix A gives the default value for each GTE and DDN national personality option.

## Associated Digital Documents

The following documents provide additional information about the router hardware and software:

- *Bridging Configuration Guide*, AA-QL29C-TE
- *Event Logging System Messages Guide*, AA-QL2AC-TE
- *Routing Protocols Reference Guide*, AA-QL2CC-TE

- *Routing Protocols User's Guide*, AA-QL2DC-TE
- *System Network Architecture Guide*, AA-QU5SA-TE
- *System Software Guide*, AA-QL2EC-TE

## Conventions Used in This Guide

|                   |  |
|-------------------|--|
| Special type      | This special type in examples indicates system output or user input.   |
| <b>Boldface</b>   | Boldface type in examples indicates user input.  |
| lowercase-italics | Lowercase italics in command syntax or examples indicate variables for which either the user or the system supplies a value.   |
| { }               | Braces indicate a choice you must make. Braces enclose values that either are separated by a vertical bar ( ) or are listed vertically. Choose either from the values separated by the vertical bar or from the list enclosed by the braces. Do not type the braces in the line of code. |
| [ ]               | Brackets enclose operands or symbols that are either optional or conditional. Specify the operand and value if you want the condition to apply. Do not type the brackets in the line of code.  |
| <u>underscore</u> | Characters underscored in a command listing represent the least number of characters you must enter to identify that command to the interpreter.   |

---

# Getting Started with Network Interfaces

This manual describes how to configure and monitor the network interfaces and the link layer protocols supported by the Bridging Router. The purpose of this chapter is to provide basic configuration and monitoring guidelines. This chapter also describes the basic procedures and the information needed to monitor the interfaces through the GWCON **interface** command.

## Network Interfaces and the GWCON Interface Command

When configuring network interfaces, you may find it necessary to display certain information about specific interfaces. While some interfaces have their own console processes for monitoring purposes, the router displays statistics for *all* installed network interfaces when you use the **interface** command from the GWCON environment. For more information on the **interface** command, refer to the chapter covering the GWCON process and commands in the *System Software Guide*.

## Accessing Network Interface Configuration Processes

In the chapters that follow, you must access various interface configuration processes. To do this, you must determine the network interface number of the device that you want configure. Then, to access the configuration process, you must activate it from the `config>` prompt by supplying that interface number.

To access any interface configuration process, perform the following steps:

1. Determine the device's network interface number by entering the **list devices** command at the `config>` prompt. For example:

```
config> list devices
Ifc 0 (Ethernet): CSR 1001600, CSR2 1000C00, vector 94
Ifc 1 (WAN PPP): CSR 1001620, CSR2 1000D00, vector 93
Ifc 2 (WAN PPP): CSR 1001640, CSR2 1000E00, vector 92
config>
```

2. Specify the appropriate number by entering a command of the form **net *n***, where *n* is the network interface number. For example, to access the Ethernet configuration process, you would enter **net 0**:

```
config> net 0
Ethernet interface configuration
ETH config>
```

## Accessing Network Interface Console Processes

The interface console processes let you monitor software configurable parameters for the specific network types used in your router.

To access any interface console process, perform the following steps:

1. Determine the network interface number by entering the **interface** command at the `GWCON (+)` prompt. For example,

```
+interface
Nt Nt' Interface      CSR  Vec  Self-Test  Self-Test  Maintenance
      Passed   Failed   Failed
0  0  Eth/0      1001600  5E    1          0          0
```

2. Specify the appropriate number by entering a command of the form **net *n***, where *n* is the network interface number. For example, to access the Ethernet console process, you would enter **net 0**:

```
+ net 0
Ethernet interface console
Eth>
```

## Accessing Link Layer Protocol Configuration and Console Processes

Refer to the *System Software Guide* for complete information about accessing the protocol configuration and console processes. These processes let you change and monitor configurable parameters for the Link Layer protocols supported by your bridging router.



---

## Configuring the Ethernet Network Interface

This chapter describes how to configure the Ethernet interface.

For information about accessing the network interface configuration process, refer to the section “Accessing Network Interface Configuration Processes” in Chapter 1.

### Ethernet Configuration Commands

This section summarizes and explains the Ethernet configuration commands. You can use these commands for the Ethernet interfaces. Enter the commands at the `ETH config>` prompt.

**Table 2–1 Ethernet Configuration Command Summary**

| Command                 | Function  |
|-------------------------|---|
| <b>? (Help)</b>         | Displays all the Ethernet commands or lists subcommand options for specific commands.                       |
| <b>Connector-Type</b>   | Sets the connector type.  |
| <b>IP-Encapsulation</b> | Sets the IP encapsulation as Ethernet type 8137 or Ethernet 802.3.  |
| <b>List</b>             | Displays the connector type, Ethernet version number, NetWare IPX encapsulation, and IP encapsulation.      |
| <b>Frame</b>            | Sets the NetWare IPX encapsulation as Ethernet type 8137, Ethernet 802.3, Ethernet 802.2, or Ethernet SNAP. |
| <b>Exit</b>             | Exits the Ethernet config process.  |

### ? (Help)

List the commands that are available from the current prompt level. You can also enter a ? after a specific command name to list its options.

**Syntax:** ?

Example: **ETH config> ?**

```
CONNECTOR-LOCATION
CONNECTOR-TYPE
IP-ENCAPSULATION
LIST
FRAME
VERSION
EXIT
```

### Connector-Type

Set the connector-type. Some Digital routers support AUI (10Base5), BNC (10Base2) and RJ45 (10BASET) connectors. Other Digital routers support AUI (10Base5), BNC (10Base2) and Auto-config options.

**Note:** You do not have to use this command because the router automatically senses the connector type.

**Syntax:** connector-type *name*

Example: **connector-type aui**

## Frame

Set the NetWare IPX encapsulation type. Refer to Table 2–2 and enter one of the following:

**Table 2–2 NetWare IPX Encapsulation Types**

| Option   | Description  | Syntax              |
|--|--|---------------------|
| Ethernet_II<br>(Ethernet type 8137)                  | Uses Ethernet type 8137 as the packet format. This format is required if you are using NetWare-VMS on the Ethernet.  | frame ethernet_II   |
| Ethernet_8023<br>(IEEE 802.3 'raw'<br>without 802.2) | Uses an IEEE 802.3 packet format without the 802.2 header. This is the command default, and also the default for NetWare versions prior to 4.0. Ethernet 802.3 does not conform to the IEEE 802. standards because it does not include an 802.2 header. It may cause problems with other nodes on the network. | frame ethernet_8023 |
| Ethernet_8022  | Packet format includes an 802.2 header. This is the default for NetWare versions 4.0 and later.  | frame ethernet_8022 |
| Ethernet_SNAP  | Uses the 802.2 format with a SNAP header. This encapsulation type is meant to be compatible with token ring SNAP encapsulation. However, it violates IEEE standards and is not interoperable across conformant bridges.  | frame ethernet_snap |

**Syntax:** frame *encapsulation type*

Example: `frame ethernet_8022`

## IP-Encapsulation

Select Ethernet (Ethernet type 8137) or IEEE-802.3 (Ethernet 802.3 without 802.2). Enter **e** or **i**.

**Syntax:** IP-encapsulation *type*

Example: `IP-encapsulation e`

## List

Display the current configuration for the Ethernet interface including the connector-type, Ethernet version, NetWare IPX encapsulation type, and the IP encapsulation type.

**Syntax:** list all

Example: **list all**

```
Connector type:          BNC (10BASE2)
ETHERNET version:       2
NetWare IPX encapsulation: Ethernet _II
IP Encapsulation:      ETHER
```

## Exit

Return to the previous prompt level.

**Syntax:** exit

Example: **exit**

---

## Monitoring the Ethernet Network Interface

This chapter describes how to monitor the Ethernet interfaces.

### Displaying Ethernet Statistics through the Interface Command

Use the **interface** command from the GWCON environment to display power-up and operating statistics of the Ethernet interface. The output formats for the various Digital routers differ. The format for the RouteAbout Access EW router is:

```
+interface
Nt Nt' Interface      CSR  Vec      Self-Test  Self-Test  Maintenance
      Passed    Failed    Failed
0  0  Eth/0      1001600  5E        1          1          0
1  1  PPP/0      1001620  5D        0         9451       0
2  2  PPP/1      1001640  5C        0         9451       0

+interface 0
Nt Nt' Interface      CSR  Vec      Self-Test  Self-Test  Maintenance
      Passed    Failed    Failed
0  0  Eth/0      1001600  5E        1          1          0

Ethernet/IEEE 802.3 MAC/data-link on SCC Ethernet interface

Physical address      08002BB19F1D
PROM address          08002BB19F1D

Input statistics:
failed, frame too long      0  failed, FCS error          0
failed, alignment error     0  failed, FIFO overrun       0
internal MAC rcv error      0  packets missed             0

Output statistics:
deferred transmission       0  single collision           0
multiple collisions         1486001  total collisions           1486001
failed, excess collisions   1486001  failed, FIFO underrun      0
failed, carrier sense err   0  SQE test error             0
late collision              0  internal MAC trans errors  0
RISC Microcode Revision    2
```

The format for the RouteAbout Access TW output format is shown below.

```
+interface 1
                                     Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec      Passed    Failed    Failed
1  1  FR/0            1001620  5D        0         0         0

Frame Relay MAC/data-link on SCC Serial Line interface

Adapter cable:                Undefined RISC Microcode Revision:          2

Line speed:                    unknown
Last port reset:              15 seconds ago

Input frame errors:
CRC error                      0 alignment (byte length)              0
missed frame                   0 too long (> 2062 bytes)             0
aborted frame                  0 DMA/FIFO overrun                    0
L & F bits not set            0

Output frame counters:
DMA/FIFO underrun errors       0 Output aborts sent                  0
+
```

The fields in the previous examples are explained below.

|                           |  |
|---------------------------|--|
| <i>Nt</i>                 | Global interface number.   |
| <i>Nt'</i>                | Reserved for dial circuit use  |
| <i>Interface</i>          | Interface name and its instance number.  |
| <i>CSR</i>                | Command and Status Register address.   |
| <i>Vec</i>                | Interrupt vector.  |
| <i>Self-Test Passed</i>   | Number of times self-test succeeded (state of interface changes from down to up).  |
| <i>Self-Test Failed</i>   | Number of times self-test failed (state of interface changes from up to down).   |
| <i>Maintenance Failed</i> | Number of maintenance failures.  |
| <i>Physical address</i>   | The ethernet address of the device currently in use. This may be the PROM address or an address overwritten by another protocol. |
| <i>PROM address</i>       | The permanent unique Ethernet address in the PROM for this Ethernet interface.   |

|  |   |
|--|---|
| <i>Interface type</i>                                    | This output specifies the connector type as AUI, BNC, or RJ45.  |
| <i>Input statistics:</i>                                 |   |
| <i>failed, packet too long or failed, frame too long</i> | The Failed, Packet Too Long counter increments when the interface receives a packet that is larger than the maximum size of 1518 bytes for an Ethernet frame. This data is exported through SNMP as the dot3StatsFrameTooLongs counter. |
| <i>failed, framing error or failed, alignment error</i>  | The Failed, Framing Error counter increments when the interface receives a packet whose length in bits is not a multiple of eight.  |
| <i>failed, FIFO over-run or failed, FIFO overrun</i>     | The Failed, FIFO (First In, First Out) Over-run counter increments when the Ethernet chipset is unable to store bytes in the local packet buffer as fast as they come off the wire.   |
| <i>collision in packet</i>                               | The counter increments when a packet collides as the interface attempts to receive a packet, but the local packet buffer is full. This error indicates that the network has more traffic than the interface can handle.                 |
| <i>short frame</i>                                       | The counter increments when the interface receives a packet with a short frame.   |
| <i>buffer full warnings</i>                              | The Buffer Full Warnings counter increments each time the local packet buffer is full.  |
| <i>packets missed</i>                                    | The Packets Missed counter increments when the interface attempts to receive a packet, but the local packet buffer is full. This error indicates that the network has more traffic than the interface can handle.                       |
| <i>internal mac rx errors</i>                            | Receive errors that are not late, excessive, or carrier check collisions. This data is exported through SNMP as the dot3StatsInternalMacReceiveErrors counter.  |

*Input*

*statistics:*

|                               |  |
|-------------------------------|--|
| <i>internal mac rx errors</i> | Receive errors that are not late, excessive, or carrier check collisions. This data is exported through SNMP as the dot3StatsInternalMacReceiveErrors counter. |
|-------------------------------|--|

*Output*

*statistics:*

|  |   |
|--|---|
| <i>initially deferred or deferred transmission</i> | The Initially Deferred counter increments when the carrier sense mechanism detects line activity causing the interface to defer transmission. This data is exported through SNMP as the dot3StatsDeferredTransmissions counter. |
|--|---|

|                         |   |
|-------------------------|---|
| <i>single collision</i> | The Single Collision counter increments when a packet has a collision on the first transmission attempt, and then successfully sends the packet on the second transmission attempt. This data is exported through SNMP as the dot3StatsSingleCollisionFrames counter. |
|-------------------------|---|

|                            |  |
|----------------------------|--|
| <i>multiple collisions</i> | The Multiple Collisions counter increments when a packet has multiple collisions before being successfully transmitted. This data is exported through SNMP as the dot3MultipleCollisionFrames counter. |
|----------------------------|--|

|                         |  |
|-------------------------|--|
| <i>total collisions</i> | The Total Collisions counter increments by the number of collisions a packet incurs. |
|-------------------------|--|

|                                  |   |
|----------------------------------|---|
| <i>failed, excess collisions</i> | The Failed, Excess Collisions counter increments when a packet transmission fails due to 16 successive collisions. This error indicates a high volume of network traffic or hardware problems with the network. This data is exported through SNMP as the dot3StatsExcessiveCollisions counter. |
|----------------------------------|---|

|                               |  |
|-------------------------------|--|
| <i>failed, FIFO under-run</i> | The Failed, FIFO Under-run counter increments when packet transmission fails due to the inability of the interface to retrieve packets from the local packet buffer fast enough to transmit them onto the network. |
|-------------------------------|--|



|   |  |
|---|--|
| <i>failed,<br/>carrier check<br/>or failed,<br/>carrier sense<br/>error</i> | The Failed, Carrier Check counter increments when a packet collides because carrier sense is disabled. This error indicates a problem between the interface and its Ethernet transceiver. This data is exported through SNMP as the dot3StatsCarrierSenseErrors counter.   |
| <i>CD heartbeat<br/>error or SQE<br/>test error</i>                         | The CD (Collision Detection) Heartbeat Error counter increments when the interface sends a packet but detects that the transceiver has no heartbeat. The packet is treated as successfully transmitted because some transceivers do not generate heartbeats. This data is exported through SNMP as the dot3StatsSQETestErrors counter. |
| <i>out of window<br/>collisions or<br/>late<br/>collisions</i>              | The Out of Window Collisions counter increments when a packet collides after transmitting at least 512 bits. This error indicates that an interface on the network failed to defer, or that the network has too many stations. This data is exported through SNMP as the dot3StatsLateCollisions counter.                              |
| <i>internal mac<br/>tx errors or<br/>internal MAC<br/>trans errors</i>      | Transmit errors that are not late, excessive, or carrier check collisions. This data is exported through SNMP as the dot3StatsInternalMacTransmitErrors counter.   |
| <i>RISC<br/>Microcode<br/>Version</i>                                       | This gives the version of the microcode running in the RISC controller of the communications processor module.   |

## Accessing the Interface Console Process

Follow the procedure described in Chapter 1 in the *System Software Guide* to access the interface console process for the interface described in this chapter. Once you access the desired interface console process, you may begin entering console commands.

## Ethernet Interface Console Commands

This section explains the Ethernet console commands. Enter commands at the ETH> prompt. Table 3–1 lists the console commands.

**Table 3–1 Ethernet Console Command Summary**

| Command           | Function  |
|-------------------|---|
| <b>? (Help)</b>   | Displays all the Ethernet commands or lists subcommand options for specific commands. |
| <b>Collisions</b> | Displays a collisions statistics for the specified Ethernet interface.                |
| <b>Exit</b>       | Exits the Ethernet config process.  |

### ? (Help)

List the commands that are available from the current prompt level. You can also enter ? after a specific command name to list its options.

**Syntax:** ?

Example: **ETH> ?**

```
COLLISIONS
EXIT
```

### Collisions

Shows the number of transmissions for packets that incurred collisions before they were successfully transmitted. The counters tally the number of packets successfully sent after the specified number of collisions for the range of 1 to 15 collisions. Increasing numbers of packets transmitting with collisions and higher numbers of collision per packet are signs of transmitting onto a busy Ethernet.

These counters are cleared by the **clear** command in the OPCON process. This data is exported through SNMP as the dot3CollTable.

**Syntax:** collisions

Example: **ETH> coll**

|                                 |   |
|---------------------------------|---|
| Transmitted with 1 collisions:  | 0 |
| Transmitted with 2 collisions:  | 0 |
| Transmitted with 3 collisions:  | 0 |
| Transmitted with 4 collisions:  | 0 |
| Transmitted with 5 collisions:  | 0 |
| Transmitted with 6 collisions:  | 0 |
| Transmitted with 7 collisions:  | 0 |
| Transmitted with 8 collisions:  | 0 |
| Transmitted with 9 collisions:  | 0 |
| Transmitted with 10 collisions: | 0 |
| Transmitted with 11 collisions: | 0 |
| Transmitted with 12 collisions: | 0 |
| Transmitted with 13 collisions: | 0 |
| Transmitted with 14 collisions: | 0 |
| Transmitted with 15 collisions: | 0 |

## Exit

Return to the previous prompt level (GWCON).

**Syntax:** exit

Example: **ETH> exit**



---

## Configuring the FDDI Network Interface

This chapter describes how to configure the FDDI network interface.

### Accessing the Interface Configuration Processes

For information about accessing the FDDI configuration environment, refer to Chapter 1.

**Note:** After you access the interface configuration process, you may begin entering configuration commands. Whenever you make a change to a user-configurable interface parameter, you must restart the router for this change to take effect.

### Network Interfaces and the GWCON Interface Command

The FDDI interface does not have its own console process that you can use for monitoring. However, you can use the **interface** command from the GWCON environment to display complete statistics for all installed network interfaces. For more information about the **interface** command and displaying statistics, refer to the GWCON chapter in the *System Software Guide*.

### Basic FDDI Configuration Procedures

The FDDI software default configuration supports a dual attach or single attach node on a standard FDDI backbone. There are no required software configuration steps although it is highly recommended that default settings be used. For special configurations, use the following commands, which are described later in this chapter:

- Use the **set config** command to indicate the ports the interface uses to transmit and receive.
- Use the **set policy** command to select the FDDI connection types.
- Use the **set station-type** command to set the FDDI station type as single-attach slave or dual-attach peer.

## FDDI Configuration Commands

This section explains the FDDI configuration commands. Enter these commands at the `FDDI Config>` prompt. Table 4–1 summarizes the FDDI configuration commands.

**Table 4–1 FDDI Configuration Command Summary**

| Command         | Function   |
|-----------------|--|
| <b>? (Help)</b> | Displays all the FDDI commands or lists subcommand options for specific commands.  |
| <b>Frame</b>    | Sets the NetWare IPX encapsulation type.   |
| <b>List</b>     | Displays FDDI software configurable information such as buffer allocation, timer settings, station types, and connection policies.   |
| <b>Set</b>      | Sets the configuration for the interface including the maximum token rotation time, frequency of NIF information frames, alarms and timers to manage connections and monitor link nodes, the type of FDDI connections, requested token rotation time, and the frequency for the head of a frame. |
| <b>Exit</b>     | Exits the FDDI configuration process.  |

### ? (Help)

List the commands that are available from the current prompt level. You can also enter `?` after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
FRAME
LIST
SET
EXIT
```

## Frame

Set the NetWare IPX encapsulation type. Table 4–2 summarizes the options you can use.

**Table 4–2 Frame Command NetWare IPX Encapsulation Types**

| Option                            | Description   | Syntax          |
|-----------------------------------|---|-----------------|
| <b>FDDI using 802.2</b>           | Uses the standard 802.2 DSAP/SSAP of E0 for IPX.                                  | frame fddi      |
| <b>FDDI using 802.2 with SNAP</b> | Uses the 802.2 with SNAP header for IPX. This is the default for Digital routers. | frame fddi_snap |

**Syntax:** frame *encapsulation type*

Example: **frame fddi**

## List

Display the FDDI configuration currently in SRAM.

**Syntax:** list all  
apple-l-oui  
config  
max-trt  
phy . . .  
policy  
req-trt  
smt-timer

station-type  
tvx-timer  
\_

#### **all**

Displays all FDDI software configurable information such as buffer allocation, timers, station types and connection policies.

Example: **list all**

```
Appletalk Phase I will use Interoperable OUI
Preferred configuration THRU-A or EITHER
TMax: 2097152

Target Rotation Time 100000 (0x186A0) byte clocks = 8.000 msec
PHYA Cutoff = 6
PHYA Alarm = 7
PHYB Cutoff = 6
PHYB Alarm = 7
Policy = reject no connections

SMT notify time (sec): 30
Station type: PEER (default)

Valid transmission expiration timer (ns): 2621440
```

#### **apple-I-OUI**

Displays whether AppleTalk Phase 1 is using interoperable or proprietary OUI in the header of the Appletalk frames.

Example: **list apple-I-OUI**

```
Appletalk Phase I will use Interoperable OUI
```

#### **config**

Displays the type of configuration in effect for the interface and shows the ports the interface uses to transmit and receive tokens.

Example: **list config**

```
Preferred configuration THRU-A
```

#### **max-trt**

Displays the maximum acceptable token rotation time in 80 nanosecond byte clocks.



Example: `list max-trt`

```
TMax: 2097152
```

### **phy a b**

Displays alarms and timers the interface uses to manage connections and monitor link errors. The valid ring names are *a* and *b*. The alarm and cutoff display a  $-\log_{10}$  rate.

Example: `list phy a`

```
PHYA Cutoff = 6  
PHYA Alarm = 7
```

### **policy**

Displays the valid types of FDDI connections for the interface.

Example: `list policy`

```
Policy = reject no connections
```

### **req-trt**

Displays the requested token rotation time in 80 nanosecond byte clocks.

Example: `list req-trt`

```
Target Rotation Time 100000 (0x186A0) byte clocks = 8.000 msec
```

### **smt-timer**

Displays the number of seconds that can pass before the interface generates NIF frames to neighbor nodes.

Example: `list smt-timer`

```
SMT notify time (sec): 30
```

### **station-type**

Displays the interface FDDI station type.

Example: **list station-type**

Station type: PEER (default)

### **tvx-time**

Displays the amount of time (in 80 nanosecond byte clocks) that can pass before the interface must see the head of a frame.

Example: **list tvx-time**

Valid transmission expiration timer (ns): 2621440

## **Set**

Specify the type of configuration including the maximum token rotation times, alarms, timers, and FDDI station type.

**Syntax:**    set        apple-I-OUI  
                  config . . .  
                  max-trt . . .  
                  notify-timer . . .  
                  phy a/b . . .  
                  policy . . .  
                  req-trt . . .  
                  station-type . . .  
                  tvx-timer . . .

### **appletalk-I-OUI**

Sets AppleTalk Phase 1 using interoperable or proprietary OUI. The valid entries are i (interoperable) or p (proprietary). Proprietary is compatible with AppleTalk Phase 1. The default setting is *proprietary*.

Example: **set Apple-I-OUI p**

### **config interface**

Selects the type of FDDI configuration in effect for the interface, a peer or a slave. Use this parameter to indicate which ports the interface transmits and receives tokens. *Interface* has five possible variables: a-thru, b-thru, a-wrap, b-wrap, and either. The default configuration is a-thru for dual attach nodes, and either for single attach nodes.

This parameter works in conjunction with the **station-type** parameter. For example, a *slave* station must use the a-wrap, b-wrap, or the either configuration type. A *peer* station must use the a-thru or b-thru configuration type.

- **A-thru** – Configure this for a peer interface port that receives the token in port A and transmits on port B. This is the default setting.
- **B-thru** – Configure this for a peer interface port that receives the token on port B and transmits on port A.
- **A-wrap** – Configure this for a slave interface port that receives the token on port A and transmits on port A.
- **B-wrap** – Configure this for a slave interface port that receives the token on port B and transmits on port B.
- **Either** – Configure this for a slave interface port that used as either an *a-wrap* or *b-wrap*. Use this for stations that are attached to more than one concentrator.

Example: `set config b-thru`

#### **max-trt #-of-byte-clks**

Selects the maximum acceptable token-rotation time (*#-of-byte-clocks*). The TRT is a timer used to schedule FDDI ring access. This parameter determines the maximum amount of time that may pass before the interface must see a token. FDDI nodes use token rotation time to claim the token during the negotiation process. During negotiation, each node uses its max-trt to determine how often it must see a token. The default setting is 2097152 and the range is 4–165 milliseconds.

Example: `set max-trt 2097152`

#### **notify-timer #-of-seconds**

Selects how often (*#-of-seconds*) the interface generates a NIF (neighborhood information frame) to neighbor nodes. This frame includes transmitting node information for use with ring management. The default time is 30 seconds. The range is 2 to 30 seconds.

**Caution:** Do not change this value unless you understand the system-wide consequences to the network.

Example: `set notify-timer ?`

SMT Notify time in seconds [65535]?

#### **phy ring type parameter value**

Manages connections and monitors link errors between the A or B ring and neighboring nodes.

|                     |   |
|---------------------|---|
| <i>Ring Type</i>    | Defines the ring (a or b) that you want to monitor.   |
| <i>Parameter</i>    | Defines the variable that you want to set. The two variables are <i>alarm</i> and <i>cutoff</i> .   |
| <i>Value</i>        | Sets the alarm and cutoff link error rates.   |
| <i>Alarm value</i>  | Sets the link error rate (value) the alarm displays. If the link error rate exceeds this level, the system sets a flag causing the SMT management station to note a problem. Set the alarm to a higher value than the cutoff value. The values are: Default = 7, Minimum = 4, Maximum = 12. |
| <i>Cutoff value</i> | Sets the link error rate (value) at which the neighbor node is cut off. If a connected node is too noisy and exceeds this rate, it is disconnected. The values are: Default = 6, Minimum = 4, Maximum = 12.   |

**Caution:** Do not change this value unless you understand the system-wide consequences to the network.

Example: `set phy a alarm 7`

#### **policy router-port-type neighbor-node-port-type**

Selects the types of FDDI connections that are valid for the interface. This command allows you to reject connections that neighboring nodes cannot support. It also allows you to prevent illegal or undesirable topologies. The default *router-port-type* policy setting is *reject*, which tells the interface to reject all connections.

The policy type you choose must be compatible with the key setting on the MICs connecting the p4222 interface. Table 4–3 summarizes rules for connections from the router to a neighbor port.

*Router-port-type* Specifies if the router accepts or rejects connections that neighboring nodes cannot support.

*Neighbor-node-port-type* Valid port types are

- **A** = Primary RCV/Secondary XMT
- **B** = Secondary RCV/Primary XMT
- **M** = Single attach to a concentrator
- **S** = Single attach node

Example: `set policy reject ab`

**Table 4–3 FDDI Port Connection Rules**

| Always Valid | Valid Unless You Set Policy To "Reject " |        | Never Valid |
|--------------|--|--------|-------------|
| A to B       | A to A                                   | S to A | M to M      |
| B to A       | A to S                                   | S to B |             |
| S to M       | A to M                                   | S to S |             |
| M to S       | B to B                                   | M to A |             |
|              | B to S                                   | M to B |             |
|              | B to M                                   |        |             |

**req-trt #-of-byte-clks**

Selects the requested token rotation time (*#-of-byte-clks*). Each FDDI node uses its requested token rotation time when negotiating to claim the token. The node with the lowest req-trt wins the bid for the token. The requested rotation time must be a value between the minimum and maximum rotation times for the interface. The default is 2,066,208 byte clocks. Each byte clock is 80 nanoseconds. Refer to the **max-trt** parameters.

**Caution:** Setting the requested token rotation time too low may cause the ring to become non-operational.

Example: `set req-trt 1000000`

#### **station-type interface-type**

Selects the interface FDDI station (node) type, *peer* or *slave*. The default setting is *peer*. You can set the software station type independent of its hardware configuration. For example, if an interface is cabled as a dual attach station, you can set its station type to *slave*.

|              |   |
|--------------|---|
| <i>Peer</i>  | Refers to a single MAC, dual attach topology. The station attaches to main FDDI ring.         |
| <i>Slave</i> | Refers to a single MAC, single attach topology. The station attaches to an FDDI concentrator. |

Example: `set station-type peer`

#### **tvx-timer #-of-byte-clks**

Selects the amount of time (in 80 nanosecond byte clocks) that may pass before the interface must see the head of a data frame. The range is 31125 to 65535 and the default is 32768 byte clocks. A large value in this field allows longer periods of time between transmissions on the ring.

Example: `set tvx-timer 31125`

#### **Exit**

Return to the Config> prompt.

**Syntax:** `exit`

Example: `exit`

---

## Monitoring the FDDI Network Interface

This chapter describes how to monitor the FDDI network interface.

### FDDI Interfaces and the GWCON Interface Command

The FDDI interface does not have its own console process that you can use for monitoring. However, you can use the **interface** command from the GWCON environment to display complete statistics for all installed network interfaces. For more information about the **interface** command and displaying statistics, refer to the GWCON chapter in the *System Software Guide*.

### Statistics Displayed For the FDDI Interface

The following statistics are displayed when you execute the **interface** command from the GWCON environment for the FDDI Interface:

| Nt | Nt' | Interface | CSR      | Vec | Pass | Fail | Fail | Input | Output |
|----|-----|-----------|----------|-----|------|------|------|-------|--------|
| 1  | 1   | FDDI/0    | 80001000 | 48  | 1    | 0    | 0    | 0     | 0      |

```

IEEE 802.2/FDDI MAC/data-link on Proteon FDDI interface
PEER Station Preferred configuration THRU-A
UNA:000093002095 -> MLA:00009300A414 -> DNA:000093002095
Policy = reject no connections
T_Neg = 0x18700 byte clocks = 8.0076 msec, Latency = 0.0025 msec
TVX = 2.621, T_Max = 167.772, T_Req = 8.000 msec
PHYA state: ACTIVE ILS in 1 PHYB state: ACTIVE ILS in 1
ECM:IN CFM:THRU_A RMT:RING_OP Noise A:0, B:0
Status: RINGOP 160177 secs since last RINGOP
ringinits:2 TVX expired ct:1 TRT expired ct:0
My bcn:0 Other bcn:0 Trace rcv:0, xmt:0
My clm:2 Hi clm:0 Lo clm:2
PHYA:LEM Alarms:0 Cutoffs:0 LCT fails:0/0 LEM Ct:0
Alarm:10^-7 Cutoff:10^-6 Estimate:10^-12
PHYB:LEM Alarms:0 Cutoffs:0 LCT fails:0/0 LEM Ct:0
Alarm:10^-7 Cutoff:10^-6 Estimate:10^-12
T_Notify 30 sec, SMT frames in:50723 SMT frames out:50726
Frames:879417, Errors:0, Losts:0, Xmts:89772, Copied:51780, Not Copied:15998
73811 rcvs forwarded, 2671 filtered, 0 in error, 0 dropped
rcv buff/stat full:0/0 0/0 0/0
xmts ok:89772, aborted:0, FIFO underrun:0, Ring popped:1
xmt MAC abtd:0, timed out:0, fail:0, reset:0, hdw err:0

```

| Nt | Nt' | Intrfc | No | CSR      | Vec | Pass | Fail | Maint: | Fail | Errs: | Input | Output |
|----|-----|--------|----|----------|-----|------|------|--------|------|-------|-------|--------|
| 3  | 3   | FDDI   | 1  | 2063FC00 | 42  | 1    | 0    |        | 0    |       | 0     | 0      |

Shows the configuration and routing statistics including the interface number, CSR address, interface self-test, maintenance-test results, and the number of input and output errors.

```

FDDI interface
PEER Station Preferred configuration THRU-A

```

Shows the interface station type and configuration. Refer to the **set station-type** and **set config** FDDI commands.

```

UNN: 000093994090 -> MLA: 000093002045 -> DNN: 0000930040B0

```

Displays the upstream neighbor, main address, and downstream neighbor addresses.



Policy = reject no connections

Shows the interface connection policy. Refer to the **set policy FDDI** command.

T\_Neg = 0x18700 byte clocks = 8.0076 msec, Latency = 0.0038 msec  
TVX = 2.621, T\_Max = 167.772, T\_Req = 8.000 msec

Displays the following timer values:

|                |   |
|----------------|---|
| <i>T_neg</i>   | Displays the token rotation time.   |
| <i>Latency</i> | Displays the amount of time for the capturing of a token and when it is reissued.   |
| <i>TVX</i>     | Displays the number of byte clocks that may expire before the interface must see the head of a frame. See the <b>set tvx-timer</b> command. |
| <i>T_max</i>   | Displays the maximum token rotation time. See the <b>set max-trt</b> command.   |
| <i>T_req</i>   | Displays the requested token rotation time. See the <b>set req-trt</b> number of byte clocks.   |

PHYA state: ACTIVE ILS in 1    PHYB state: ACTIVE ALS in 1

Shows the status of the PHY A and B lines states. The line states are as follows:

|            |                    |
|------------|--------------------|
| <i>ALS</i> | Active line state. |
| <i>HLS</i> | Halt line state.   |
| <i>ILS</i> | Idle line state.   |
| <i>MLS</i> | Master line state. |
| <i>NLS</i> | Noise line state.  |
| <i>NSD</i> | No signal detect.  |
| <i>QLS</i> | Quiet line state.  |

ECM:IN      CFM:THRU\_A      RMT:RING\_OP      Noise:A:1, B:1  
Status: RINGOP 278 secs since last RINGOP  
ringinits:15    TVX expired ct:5      TRT expired ct:0

Represents the ring operating status from the FDDI SMT layer software as follows:

|            |  |
|------------|--|
| <i>ECM</i> | Displays the entity connection management state. This is the software controlling the bypass switch. |
| <i>CFM</i> | Displays the configuration management state.   |

|                    |  |
|--------------------|--|
| <i>RMT</i>         | Specifies the ring management software monitoring the state of the ring.                                 |
| <i>Noise</i>       | Displays the number of times a noise byte occurred on the PHY A and PHY B connections.                   |
| <i>Status</i>      | Displays the last time the ring became operational.  |
| <i>Ringinits</i>   | Displays the number of times initialization of the ring occurred.  |
| <i>TVX expired</i> | Displays the number of times the valid transmission timer expired. See the <b>set TVX-timer</b> command. |
| <i>TRT expired</i> | Displays the number of times the target rotation timer expired.  |

```

My bcn:0      Other beacon:0    Trace rcv:0,   xmt:0
My clm:15     Hi clm:0      Lo clm:9

```

Shows the number of times the interface entered a beacon transmit state, and the number of times the interface saw its own and other beacon frames.

These lines also show the number of times the interface entered the claim state, the number of times it saw its own claim frames, and the number of times it saw frames with higher and lower claim values than its own.

```

PHYA:LEM Alarms:0      Cutoffs:0      LCT fails:0/0      LEM Ct:49
      Alarm:10^-7      Cutoff:10^-6      Estimate:10^-12
PHYB:LEM Alarms:0      Cutoffs:0      LCT fails:0/0      LEM Ct:9
      Alarm:10^-7      Cutoff:10^-6      Estimate:10^-12

```

Shows the Link Error Monitor (LEM) information for each PHY connection as follows:

|                  |  |
|------------------|--|
| <i>Alarms</i>    | Displays the acceptable link error rate and the number of times the link error rate exceeded this value for each interface connection. See the <b>set phy</b> alarm command. |
| <i>Cutoff</i>    | Displays the number of times cutoffs occurred. See the <b>set phy</b> cutoff command.  |
| <i>LCT fails</i> | Displays the number of times the link confidence test failed.  |
| <i>LEM count</i> | Displays the total number of link error events that occurred.  |
| <i>Estimate</i>  | Displays an estimate of the total error rate for each interface connection.  |

```
T_Notify 30 sec, SMT frames in:300      SMT frames out:310
```

Shows the following SMT frame information:

|                   |   |
|-------------------|---|
| <i>T_notify</i>   | Displays how often the interface generates NIF frames to neighbor nodes. See the <b>set notify-timer</b> command. |
| <i>SMT frames</i> | Displays the number of SMT frames received and generated by the interface.  |

```
Frame:57439, Errors:3, Losses:0, Xmts:1208, Copied:1291, Not Copied:157
```

Shows the number of frames passed on the ring, the total CRC errors for the ring, the total frames lost and the number of frames copied and not copied on the ring.

```
5706 rcvs forwarded, 0 filtered, 0 in error, 0 dropped
rcv buff/stat full:6/00/00/0
```

Shows the following numbers for frames on the network: forwarded, filtered, errors, and dropped.

```
xmts ok:1208, aborted:0, FIFO underrun:6, Ring popped:0
xmt MAC aborted:0, timed out:0, fail:0, reset:0, hdw err:0
```

Shows the number of token errors, the number of missed frames, the number of times the receive buffer was too full to accept incoming frames, and, whether the ring popped due to a bad fiber.

---

## Configuring the Frame Relay Interface

This chapter describes the Frame Relay configuration commands.

Refer to the *Routing Protocols Reference Guide* for more information about the Frame Relay protocol.

### Accessing the Frame Relay Configuration Environment

For information about accessing the Frame Relay configuration environment, refer to Chapter 1.

**Note:** After you access the interface configuration process, you may begin entering configuration commands. Whenever you make a change to a user-configurable interface parameter, you must restart the router for this change to take effect.

### Frame Relay Basic Configuration Procedure

This section outlines the minimum configuration steps that are required to get the Frame Relay protocol up and running. This procedure includes adding the Frame Relay (FR) device and selecting the type FR management. If you desire any further configuration information and explanation, refer to the configuration commands described in this chapter.

To configure the Frame Relay protocol, perform the following steps:

1. **Set the selected device to frame relay.** You must set up the FR device from the `Config>` prompt using the **set datalink frame-relay** commands. By default the devices are initially configured to be PPP datalinks.

2. **Select FR management.** The FR Local Management Interface protocol defaults to Revision 1. You have the option of connecting to a network using LMI-Rev1 management, ANSI Annex D management, or CCITT management. Use the **enable** and **set** commands at the `FR Config>` prompt to enable and set the required management.
3. **Add a PVC.** Add any required PVCs that are needed if FR management is disabled or orphan circuits are disabled. Use the **add permanent-virtual-circuit** command from the `FR Config>` prompt.

Note: Note: Do not use the `add permanent-virtual-circuit` command to add PVCs for use by PPP encapsulation over frame relay. These PVCs are added when the PPP-FR pseudo device is configured..

4. **Configure FR destination addresses.** If you are running a protocol, such as IP, IPX, and so forth over the FR interface, and are interconnecting with devices not supporting ARP on FR, use the **add protocol-address** command from the `FR Config>` prompt to add the static protocol and address mapping.

## Frame Relay Configuration Commands

The Frame Relay configuration commands allow you to create or modify a Frame Relay configuration. This section summarizes and then explains the Frame Relay configuration commands. Enter all the Frame Relay configuration commands following the Frame Relay prompt within the network configuration console. Defaults for any command and its parameters are enclosed in brackets immediately following the prompt.

**Table 6–1 Frame Relay Configuration Commands Summary**

| <b>Command</b>  | <b>Function</b>  |
|-----------------|--|
| <b>? (Help)</b> | Lists the configuration commands or lists any parameters associated with the commands.   |
| <b>Add</b>      | Adds PVCs and destination protocol addresses to the Frame Relay interface.   |
| <b>Change</b>   | Changes PVCs that were added using the Add command.  |
| <b>Disable</b>  | Disables any enabled Frame Relay features.   |
| <b>Enable</b>   | Enables Frame Relay features such as, circuit monitoring, management options, multicast, protocol-broadcast, and orphans.  |
| <b>List</b>     | Displays the current configuration of the LMI and PVCs.  |
| <b>Remove</b>   | Deletes any previously added PVCs or protocol addresses.   |
| <b>Set</b>      | Configures the properties associated with Frame Relay parameters (cir-adjustment, framesize, line-speed, N1-parameter, N2-parameter, N3-parameter, P1-parameter, and T1-parameter). Sets the frame relay management options and the physical layer parameters. |
| <b>Exit</b>     | Exits the Frame Relay configuration and returns to the <code>Config&gt;</code> prompt.   |

## Enabling Frame Relay Management

There are three management options under Frame Relay: LMI Revision 1, ANSI Annex D, and LMI CCITT. Frame Relay defaults to management type Rev 1 enabled; if you want to change management types, or if you want to re-enable Rev 1 management, follow the procedure described below. Enabling management over Frame Relay is a two-step process:

1. Enter **enable lmi** at the `FR Config>` prompt to enable all management activity.
2. Enter **set lmi\_type** at the `FR Config>` prompt to select the type of management for the interface. Refer to the following table for details of the management types available.

The options available under the **set** command for enabling Frame Relay management are listed below. An example of how to set these management modes is shown in Table 6–2. Refer to the **enable** and **set** command sections in this chapter for more information.

**Table 6–2 Frame Relay Set Commands Options**

| Command    | Options        | Description  | Default |
|------------|----------------|--|---------|
| <b>set</b> | lmi-type rev1  | Conforms to LMI Revision 1, (Stratacom's Frame Relay Interface Specification)  | Enabled |
|            | lmi-type ansi  | Conforms to ANSI T1.617 USDN–DSS1–Signalling Specification for Frame Relay Bearer Service (known as Annex D)         | –N/A–   |
|            | lmi-type ccitt | Conforms to Annex A of CCITT Recommendation Q.933 – DSS1 Signalling Specification for Frame Mode Basic Call Control. | –N/A–   |

Example: **enable lmi**

**set lmi-type ansi**

## ? (Help)

List the commands that are available from the current prompt level. You can also enter **?** after a specific command name to list its options.

**Syntax:** ?

Example: ?

```

ADD
CHANGE
DISABLE
ENABLE
LIST
REMOVE
SET
EXIT

```



Example: **set ?**

```
ENCODING
FRAMESIZE
IDLE
LMI-Type
LINE-SPEED
N1-PARAMETER
N2-PARAMETER
N3-PARAMETER
T1-PARAMETER
TRANSMIT DELAY
```

## Add

Add a PVC or destination protocol address supported by the Frame Relay interface.

**Syntax:**    add        permanent-virtual-circuit  
                                  protocol-address . . .

### **permanent-virtual-circuit**

Adds a PVC to the Frame Relay interface beyond the default range of 15. The maximum number of PVCs that can be added is approximately 64, but the actual number of PVCs that can be supported by the interface is affected by the configured size of the receive buffer on the interface.

**Note:** A single LMI status message is used for all PVCs assigned to the interface.

Example: **add permanent-virtual-circuit**

```
Circuit Number [16]?
Committed Information Rate in bps [64000]?
Assign Circuit name []?
```

|                                   |  |
|-----------------------------------|--|
| <i>Circuit Number</i>             | Indicates the circuit number in the range of 16 to 1007.   |
| <i>Committed Information Rate</i> | Indicates the committed information rate (CIR) in a range of 300 bps to 2048000 bps. The default is 64 Kbps.   |
| <i>Assign Circuit Name</i>        | Indicates the ASCII string that is assigned to describe the circuit. This parameter is optional. It is recommended that you use a name that describes the characteristics of the circuit. The default is <i>unassigned</i> . |

Note: Do *not* use this command to create a permanent virtual circuit for use by a PPP-FR pseudo device. A PVC is created for this purpose when you use the **set frame-relay** command from the PPP-FR configuration environment. For information about configuring PPP-FR pseudo devices refer to Chapter 10.

#### **protocol-address *protocol-name***

Adds statically configured destination protocol (*protocol-name*) addresses to the Frame Relay interface. Adding protocol name and address mappings (static ARP) alleviates using ARP during the forwarding process. This configuration feature may be necessary when interconnecting to Frame Relay equipment that does not support ARP.

This parameter prompts you for different information depending on the type of protocol that you adding.

Example: **add protocol-address**

```
Protocol name or number [0]?
```

The protocol-address parameter prompts you for different information depending on the type of protocol that you add. Possible prompts are listed in Table 6-3.

**Table 6–3 Protocol-address Prompts for the Add Command**

| Protocol     | First Prompt             | Second Prompt        |
|--------------|--------------------------|----------------------|
| IP protocol  | IP Address [0.0.0.0]?    | Circuit Number [16]? |
| DN protocol  | Node address [0.0]?      | Circuit Number [16]? |
| IPX protocol | Host Number (in hex) []? | Circuit Number [16]? |
| APL protocol | Host Number (in hex) []? | Circuit Number [16]? |
| AP2 protocol | Host Number (in hex) []? | Circuit Number [16]? |

*Protocol name or number* Defines the name or number of the protocol that you are deleting. If you try to delete an unsupported protocol the system prompts you with the supported protocols and their numbers:

| Prot # | Name |
|--------|------|
| 0      | IP   |
| 4      | DN   |
| 7      | IPX  |
| 14     | APL  |
| 15     | AP2  |

*IP Address* Defines the 32-bit Internet address in dotted-decimal notation.

*Node Number* Defines the area and node number of the interface attached to the DNA network.

*Host Number* Defines the 48-bit MAC address of the IPX host. Note that this address can be substituted or changed at run time if IPX is configured on Ethernet interfaces as well as Frame Relay.

*Circuit Number* Defines the PVC in the range of 16 to 1007 that this protocol is to run over.

## Change Permanent-Virtual-Circuit

Change any previous PVCs that were added with the **add permanent-virtual-circuit** command.

**Syntax:** `change permanent-virtual-circuit`

Example: `change permanent-virtual-circuit`

```
Circuit Number [16]?
Committed Information Rate in bps [64000]?
Assign Circuit Name: []?
```

*Circuit Number*      Indicates the circuit number in the range of 16 to 1007.

*Committed Information Rate*      Indicates the committed information rate (CIR) in a range of 300 bps to 2048000 bps. The default is 64000 bps.

*Assign circuit Name*      Indicates the ASCII character string designation for the circuit that you want to change.

## Disable

Disable those features previously enabled using the **enable** command.

**Syntax:** `disable` `cir-monitor`  
`lmi`  
`multicast-emulation`  
`orphan-circuits`  
`protocol-broadcast`

### **cir-monitor**

Disables the circuit monitoring feature that maintains the transmission rate at the CIR that was previously configured using the **add permanent-virtual-circuit** command. The default setting for this feature is disabled.

Example: `disable cir-monitor`

## **lmi**

Disables all management activity. All circuits that were statically added are marked as present and active from the network perspective. The system sets lmi rev 1 to *enabled* as the default.

Note: Disabling this parameter allows for normal operation or end-to-end Frame Relay testing in the absence of a real network or management interface. With end-to-end Frame Relay testing it is necessary to add like PVCs (that is, the same number like 16 and 16) on both ends of the link.

Example: `disable lmi`

## **multicast-emulation**

Disables the multicast emulation on each active PVC. The default setting for this feature is enabled. If you disable this feature, you must add protocol static address maps.

Example: `disable multicast-emulation`

## **orphan-circuits**

Prohibits the use of all nonconfigured orphan circuits at the interface. The default setting for orphan circuits is enabled.

Example: `disable orphan-circuits`

## **protocol-broadcast**

Prohibits protocols such as RIP, to function over the Frame Relay interface. The default setting for this feature is enabled.

Example: `disable protocol-broadcast`

## Enable

Enable Frame Relay features such as `cir-monitor`, `management`, `multicast-emulation`, `protocol-broadcast`, and `orphan-circuits`.

**Syntax:**    `enable`    `cir-monitor`  
                  `lmi`  
                  `multicast-emulation`  
                  `orphan-circuits`  
                  `protocol-broadcast`

### `cir-monitor`

Enables the circuit monitoring feature that maintains the transmission rate at the CIR that was previously configured using the **`add permanent-virtual-circuit`** command. The default setting for this feature is disabled.

Example: `enable cir-monitor`

### `enable lmi`

Enables management activity. All circuits that were statically added are marked as present and active from the network perspective.

After issuing the **`enable lmi`** command, use the **`set`** command to select the management mode for your frame relay interface. See the section in this chapter, “Enabling Frame Relay Management,” or the **`set`** command for more information. The system defaults to LMI Revision 1.

Use the **`enable lmi`** command to resume LMI Revision 1 management if you have previously disabled frame relay management or if you want to return to this management mode from another. To set the default of `rev1` management mode, you need only enter **`enable lmi`**.

Example: `enable lmi`

### `multicast-emulation`

Enables multicast emulation on each PVC when a protocol multicast is forwarded. The default for this parameter is enabled.

Example: `enable multicast-emulation`

### orphan-circuits

Enables the use of all nonconfigured orphan circuits. The default for this feature is enabled and the CIR values default to 64000 bps.

Example: `enable orphan-circuits`

### protocol-broadcast

Allows protocols such as RIP to function over the Frame Relay interface. The multicast parameter must be enabled for the protocol-broadcast to function properly. The default setting for this feature is enabled.

Example: `enable protocol-broadcast`

## List

Display currently configured management and PVC information.

**Syntax:** `list` hdlc  
lmi  
permanent-virtual-circuits  
protocol-address

### hdlc

Displays Frame Relay HDLC configuration.

Example: `list hdlc`

```
FRAME RELAY HDLC CONFIGURATION
Encoding      = NRZ           Idle           = Flag
Clocking      = External
Cable Type    = V.35 DTE
Line access rate bps = 64000  Interface MTU in bytes = 2048
Transmit Delay = 0
```

*Encoding*                    Indicates the encoding type: NRZ or NRZI.

*Idle*                         Indicates the idle type configured, either flag or mark.

*Cable type*                   Indicates the cable type configured, either RS-232, RS-423, V.35, V.36, or X.21.

|                                       |   |
|---------------------------------------|---|
| <i>Line Access Rate</i><br><i>bps</i> | Indicates the physical rate for the Frame Relay interface.  |
| <i>Interface MTU</i><br><i>bytes</i>  | Indicates the maximum transmission unit (amount of user data per frame) that can be transmitted or received over the network at any given time. |
| <i>Transmit Delay</i>                 | Indicates the delay configured between transmitted packets.   |

### **Imi**

Displays logical management and related configuration information about the Frame Relay interface.



Example: `list lmi`

FRAME RELAY CONFIGURATION

```
LMI enabled = Yes          LMI DLCI          = 0
LMI type    = REV1        LMI Orphans OK   = Yes

Protocol Broadcast = Yes
Emulate Multicast = Yes   CIR monitoring     = No

PVCs P1 Allowed   = 64   CIR monitor adjust = 1
Timer T1 seconds  = 10   Counter N1 increments = 2
LMI N2 error threshold = 3   LMI N3 error threshold window = 4
```

|                           |  |
|---------------------------|--|
| <i>LMI enabled</i>        | Indicates whether the management features are enabled on the Frame Relay interface, yes or no.   |
| <i>LMI DLCI</i>           | Indicates the management circuit number. This number reflects the LMI type, 0 for ANSI or 1023 for LMI.  |
| <i>LMI Type</i>           | Indicates the LMI type: one of the configured management modes: Rev1, ANSI, or CCITT.  |
| <i>LMI Orphans OK</i>     | Indicates if nonconfigured circuits are available for use, yes or no.  |
| <i>Protocol Broadcast</i> | Indicates whether protocols such as RIP may function over the Frame Relay interface, yes or no.  |
| <i>Emulate multicast</i>  | Indicates whether the multicast emulation is enabled on each active PVC, yes or no.  |
| <i>CIR monitoring</i>     | Indicates whether the circuit monitoring feature that maintains the transmission rate at the CIR is enabled, yes or no.  |
| <i>PVCs P1 allowed</i>    | Indicates the number of allowable PVCs for use with this interface.  |
| <i>CIR monitor adjust</i> | Indicates the maximum burst transmission speed allowed over a PVC when CIR monitoring is enabled. The range is 1 to 100. The maximum burst transmission speed is the configured CIR value times the CIR monitor adjust entry. This value is configured with <code>set cir-adjustment</code> command. |

|                                      |  |
|--------------------------------------|--|
| <i>Timer T1 seconds</i>              | Indicates the frequency that the Frame Relay interface performs a sequence number exchange with management.                  |
| <i>Counter N1 increments</i>         | Indicates the interval (in seconds) that the Frame Relay interface queries the management for complete PVC status enquiry.   |
| <i>LMI N2 error threshold</i>        | Indicates the amount of management event errors occurring within the N3 window causing a reset of the frame relay interface. |
| <i>LMI N3 error threshold window</i> | Indicates the number of monitored events that count for measuring N2.  |

### permanent-virtual-circuits

Displays all the configured PVCs on the Frame Relay interface, including PVCs in use by PPP-FR pseudo devices.

Example: `list permanent-virtual-circuit`

```
Maximum PVCs Allowable = 64
Total PVCs Configured  = 3
```

| Circuit Name | Circuit Number | Circuit Type | CIR in bps | Burst Size | Excess Burst |
|--------------|----------------|--------------|------------|------------|--------------|
| Boston       | 16             | Permanent    | 2400       | 2400       | 0            |
| Unassigned   | 20             | Permanent    | 4800       | 4800       | 0            |
| PPP Circuit  | 100            | Permanent    | 64000      | 64000      | 0            |

|                               |  |
|-------------------------------|--|
| <i>Maximum PVCs allowable</i> | Indicates the number of PVCs that can exist for this interface. This number includes any PVCs that you added with the <b>add permanent-virtual-circuit</b> command and dynamically learned through the management interface. |
| <i>Total PVCs configured</i>  | Indicates the total number of currently configured PVCs for this interface.  |

|                                   |   |
|-----------------------------------|---|
| <i>Circuit Name</i>               | Indicates the ASCII designation of the configured PVC.  |
|                                   | Note: The Circuit Name of PVCs in use by PPP-FR pseudo interfaces is always set to <i>PPP Circuit</i> .                           |
| <i>Circuit Number</i>             | Indicates the number of a currently configured PVC.   |
| <i>Circuit Type</i>               | Indicates the type of virtual circuit currently configured. This release of Frame Relay supports only permanent virtual circuits. |
| <i>Committed Information Rate</i> | Indicates the information rate guaranteed over the interface.   |

### protocol-addresses

Displays all the statically configured protocol addresses circuit mappings at the Frame Relay interface.

Example: `list protocol-addresses`

| Protocol Type | Protocol Address | Circuit Number |
|---------------|------------------|----------------|
| IP            | 128.185.121.10   | 40             |
| IP            | 128.185.136.43   | 41             |
| IP            | 128.185.115.70   | 109            |
| IPX           | 0000930b234f     | 34             |
| IPX           | 0000930b235f     | 35             |
| IPX           | 0000930b236f     | 36             |

|                         |  |
|-------------------------|--|
| <i>Protocol Type</i>    | Displays the name of the protocol running over the interface.    |
| <i>Protocol Address</i> | Displays the address of the protocol running over the interface. |
| <i>Circuit Number</i>   | Displays the PVC that is handling the protocol.                  |

## Remove

Delete any PVC or protocol-address previously added using the **add permanent-virtual-circuit** command.

**Syntax:**    remove   permanent-virtual-circuit . . .  
  protocol-address

### **permanent-virtual-circuit *pvc#***

Deletes any configured PVC in the range of 16 to 1007.

Example: **remove permanent-virtual-circuit 20**

Note: You should not remove a PVC which is in use by a PPP-FR pseudo device unless you delete the PPP-FR pseudo device as well. (For more information on the **delete** command, refer to the CONFIG chapter in the *System Software Guide*.)

### **protocol-address**

Deletes any configured protocol addresses (static ARP entries). This parameter prompts you for different information depending on the type of protocol that you are adding.

Example: **remove protocol-address**

Protocol name or number [IP]?

The protocol-address parameter prompts you for different information depending on the type of protocol that you delete. Possible prompts are listed in Table 6-4.

**Table 6–4 Protocol-address Prompts for the Remove Command**

| Protocol      | First Prompt             | Second Prompt        |
|---------------|--------------------------|----------------------|
| IP protocol:  | IP Address [0.0.0.0]?    | Circuit Number [16]? |
| DN protocol:  | Host Number (in hex)[ ]? | Circuit Number [16]? |
| IPX protocol: | Host Number (in hex)[ ]? | Circuit Number [16]? |
| APL protocol: | Host Number (in hex)[ ]? | Circuit Number [16]? |
| AP2 protocol: | Host Number (in hex)[ ]? | Circuit Number [16]? |

*Protocol name or number* Defines the name or number of the protocol that you are deleting. If you try to delete an unsupported protocol the system prompts you with the supported protocols and their numbers:

| Prot # | Name |
|--------|------|
| 0      | IP   |
| 4      | DN   |
| 7      | IPX  |
| 14     | APL  |
| 15     | AP2  |

*IP Address* Defines the 32-bit internet address in dotted-decimal notation.

*Host Number* Defines the 48-bit MAC address of the IPX or XNS host.

*Circuit Number* Defines the PVC in the range of 16 to 1007 that the protocol runs over.

## Set

Configure the interface to run the Frame Relay protocol.

## Set Command Considerations

Two parameters, the n2-parameter and the n3-parameter, require further explanation before you configure them. The n2 parameter sets the error threshold for management events, and the n3-parameter sets the number of events that are monitored in the event window. If the number of management errors in the event window equals n2, the frame relay interface resets. For example:

```
set n3-parameter 4  
set n2-parameter 3
```

You now have a window size of 4 ( $n3 = 4$ ) and an error threshold of 3 ( $n2 = 3$ ). That means the system is monitoring 4 management events and checking to determine if any of those are in error. If the number of events in error equals 3 (the n2 parameter), the frame relay interface is reset and the status of the network is considered “network down.”

For the status of the network to be considered “network up,” the number of events in error within the window must be less than n2 prior to any change in status.

Note: The options indicated with \* (asterisks) may or may not appear, depending on which type of serial interface is in use.

**Syntax:**    set            cir-adjustment  
                  encoding \*  
                  frame-size  
                  idle . . . \*  
                  lmi-type  
                  n1-parameter  
                  n2-parameter  
                  n3-parameter  
                  p1-parameter  
                  t1-parameter  
                  transmit delay . . . \*

#### **cir-adjustment *multiplier***

Allows you to configure an increase in the allowable transmission speed (burst rate) over every PVC at the Frame Relay interface, when CIR monitoring is enabled. The allowable range is 1 to 100 with a default of 1. The maximum burst transmission speed is the configured CIR value times the CIR monitor adjust entry.

Note: Set the multiplier to a value that prevents transmissions above the excess burst rate set by the vendor.

Example: **set cir-adjustment**

```
CIR monitor adjustment [1]?
```

#### **encoding *NRZ* or *NRZI***

Sets the HDLC transmission encoding scheme as NRZ (Non-return to zero) or NRZI (Non-return to zero inverted). Most configurations use NRZ which is the default.

Example: **set encoding nrz**

### **frame-size value**

Sets the size of the network layer portion of frames transmitted and received on the data link. Data link and MAC layer headers are not included. The default value is 2048.

Example: `set frame-size 2000`

### **idle flag or mark**

Sets the transmit idle state for HDLC framing. The default is flag, which provides continuous flags (7E hex) between frames. The mark option puts the line in a marking state (OFF, 1) between frames.

Example: `set idle flag`

### **lmi-type management type**

Sets the management type for the interface. See the section, “Enabling Frame Relay Management” for details about setting Frame Relay management. The default is type *Rev 1* enabled. Table 6–5 lists the Frame Relay set command options.

**Table 6–5 Frame Relay Set Commands Options**

| <b>Command</b> | <b>Options</b> | <b>Description</b>   | <b>Default</b> |
|----------------|----------------|--|----------------|
| <b>set</b>     | lmi-type rev1  | Conforms to LMI Revision 1, (Stratacom’s Frame Relay Interface Specification).                                       | Enabled        |
|                | lmi-type ansi  | Conforms to ANSI T1.617 USDN–DSS1–Signalling Specification for Frame Relay Bearer Service (known as Annex D).        | –N/A–          |
|                | lmi-type ccitt | Conforms to Annex A of CCITT Recommendation Q.933 – DSS1 Signalling Specification for Frame Mode Basic Call Control. | –N/A–          |



Example: `enable lmi`

```
set lmi-type rev1 (default)
lmi-type ansi
lmi-type ccitt
```

#### **n1-parameter *count***

Configures the number of T1 timer intervals that must expire before a complete PVC status enquiry is made. *Time* is the interval in the range of 5 to 30. The default is 2.

Example: `set n1-parameter`

```
Parameter N1 [2]?
```

#### **n2-parameter *max#***

Configures the number of errors that can occur in the management event window monitored by the n3-parameter before the frame relay interface resets. This parameter is used for certification purposes only. *Max#* is a number in the range of 1 to 10. The default is 3. This parameter must be less than or equal to the n3-parameter or you receive an error message.

Example: `set n2-parameter`

```
Parameter N2 [3]?
```

#### **n3-parameter *max#***

Configures the number of monitored management events for measuring the n2-parameter. This parameter is used for certification purposes only. *Max#* is a number in the range of 1 to 10. The default is 4.

Example: `set n3-parameter`

```
Parameter N3 [4]?
```

#### **p1-parameter *max#***

Configures the maximum number of PVCs supported by the Frame Relay interface. *Max#* is a number in the range of 0 to 64. The default is 64. A 0 (zero) implies that the interface supports no PVCs.

Example: `set p1-parameter`

Parameter P1 [64]?

### **t1-parameter *time***

Configures the interval (in seconds) that the Frame Relay interface takes to perform a sequence number exchange with Frame Relay management. The management's T2 timer is the allowable interval for an end station to request a sequence number exchange with the manager. The T1 interval must be less than the T2 interval of the network. *Time* is the number in the range of 5 to 30. The default is 10.

Example: `set t1-parameter`

### **transmit-delay #**

Allows the insertion of a delay between transmitted packets. The purpose of this command is to slow the serial line so that it is compatible with older, slower serial devices at the other end. It can also prevent the loss of serial line hello packets between the lines.

If you have problems missing frames at the remote end, then increase the transmit delay on the side that is not missing frames.

Example: `set transmit 1`

## **Exit**

Return to the `Config>` prompt.

**Syntax:** `exit`

Example: `exit`

---

## Monitoring Frame Relay Interfaces

This chapter describes the Frame Relay console commands.

For more information on the Frame Relay protocol, refer to the *Routing Protocols Reference Guide*.

### Accessing the Frame Relay Console Environment

For information about accessing the Frame Relay console environment, refer to Chapter 1.

### Frame Relay Console Commands

Table 7–1 summarizes the Frame Relay Console and related commands, which are explained in the sections that follow. Use these commands to gather information from the database.

**Table 7–1 Frame Relay Console Commands Summary**

| Command  | Function  |
|----------|---|
| ? (Help) | Displays all the Frame Relay console commands (clear and list) or any options associated with those commands. |
| Clear    | Clears statistical information on the frame relay interface.  |
| List     | Displays statistics specific to the datalink layer and frame relay management.                                |
| Exit     | Exits the frame relay console process.  |

**Note:** In this section, the terms *circuit number* and *PVC* are equivalent to the term “DLCI (Date Link Circuit Identifier).”

### ? (Help)

List the commands that are available from the current prompt level. You can also enter a ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
Clear
List
Exit
```

### Clear

Use the **clear** command to remove all statistics on the frame relay interface.

**Note:** Statistics may also be cleared by using the OPCON **clear** command.

**Syntax:** clear

Example: **clear**

### List

Display statistics specific to the datalink layer and the frame relay interface.

**Syntax:** list      all  
                          circuit  
                          lmi  
                          permanent-virtual-circuit

#### all

Displays circuit, management, and PVC statistics on the frame relay interface. The output display for this command is a combination of the **list lmi** and **list permanent-virtual-circuit** commands.

Example: **list all**

## **circuit pvc#**

Displays detailed PVC configuration and statistical information for the specified PVC (*pvc#*).

Example: **list circuit 100**

```
Circuit name = PPP Circuit

Circuit state      = Active  Circuit is orphan   = No
Frames transmitted = 6918  Bytes transmitted  = 1143758
Frames received    = 196    Bytes received     = 11594
Total FECNs       = 0      Total BECNs        = 0
Times congested   = 0      Times Inactive     = 0
CIR in bits/second = 64000 Current Info Rate  = 64000
Committed Burst (Bc) = 64000 Excess Burst (Be) = 0

Xmit frames dropped due to queue overflow = 0
```

|                                 |  |
|---------------------------------|--|
| <i>Circuit name</i>             | Indicates the ASCII designation of the configured PVC.   |
| <i>Circuit state</i>            | Indicates the state of the circuit: active, inactive, or congested. <i>Inactive</i> indicates waiting for management. <i>Active</i> indicates that data is being transferred. <i>Congested</i> indicates that data flow is being controlled. |
| <i>Circuit is orphan</i>        | Indicates whether the circuit is a non-configured circuit learned through management.  |
| <i>Frames/Bytes transmitted</i> | Indicates how many frames and bytes this PVC has transmitted.  |
| <i>Frames/Bytes received</i>    | Indicates how many frames and bytes that this PVC has received.  |
| <i>Total FECNS</i>              | Indicates the number of times that this PVC was notified of inbound or downstream congestion.  |
| <i>Total BECNs</i>              | Indicates the number of times that this PVC was notified of outbound or upstream congestion.   |
| <i>Times congested</i>          | Indicates the number of times that this PVC was congested.   |
| <i>Times inactive</i>           | Indicates the number of times that this PVC was inoperable.  |
| <i>CIR in bits/sec</i>          | Indicates the information rate of the PVC in the range of 300 bps to 2048000 bps.  |

|   |   |
|---|---|
| <i>Committed Burst</i><br>( <i>Bc</i> ) | Indicates the maximum amount of committed data that the PVC can transmit, in the range of 300 bps to 2048000 bps. |
| <i>Excess Burst</i><br>( <i>Be</i> )    | Indicates the maximum allowed amount of uncommitted data for the PVC in the range of 0 bps to 2048000 bps.        |
| <i>Xmit Frames</i><br><i>dropped</i>    | Indicates the number of frames that this PVC has dropped.   |

## lmi

Displays statistics relevant to the logical management on the frame relay interface.

Example: `list lmi`

### Management Status:

|                           |          |                               |        |
|---------------------------|----------|-------------------------------|--------|
| LMI enabled               | = Yes    | LMI DLCI                      | = 0    |
| LMI type                  | = ANSI   | LMI Orphans OK                | = Yes  |
| LMI seq interval seconds  |          |                               | = 3    |
| Protocol broadcast        | = Yes    |                               |        |
| Emulate multicast         | = Yes    | CIR monitoring                | = No   |
| PVCs allowed              | = 64     | Interface MTU bytes           | = 2048 |
| Line access rate bps      | = 256000 | CIR monitor adjust            | = 1    |
| Timer T1 seconds          | = 10     | Counter N1 increments         | = 2    |
| LMI N2 threshold          | = 3      | LMI N3 error threshold window | = 4    |
| Current receive sequence  | = 165    |                               |        |
| Current transmit sequence | = 30     |                               |        |
| Total status enquiries    | = 7      | Total status responses        | = 23   |
| Total sequence requests   | = 16     | Total responses               | = 23   |

### PVC Status:

|                |      |                  |      |
|----------------|------|------------------|------|
| Total Allowed  | = 64 | Total configured | = 25 |
| Total Active   | = 1  | Total Congested  | = 1  |
| Total Left Net | = 0  | Total Join Net   | = 0  |

|                    |  |
|--------------------|--|
| <i>LMI enabled</i> | Indicates if frame relay management is active, yes or no.  |
| <i>LMI DLCI</i>    | Indicates the management circuit number. This number is either 0 (ANSI default) or 1023 (interim LMI). |

|                                      |  |
|--------------------------------------|--|
| <i>LMI type</i>                      | Indicates the type of frame relay management being used, ANSI or LMI.  |
| <i>LMI orphans OK</i>                | Indicates if all non-configured circuits made known by management are available for use, yes or no.                                    |
| <i>LMI seq interval seconds</i>      | Indicates the interval that management uses when exchanging keep alive information with an end station.                                |
| <i>Protocol broadcast</i>            | Indicates if protocols such as RIP are able to operate over the frame relay interface.   |
| <i>Emulate multicast</i>             | Indicates whether the multicast emulation is enabled on each active PVC, yes or no.  |
| <i>CIR monitoring</i>                | Indicates whether the circuit monitoring feature that limits the router transmission rate is enabled, yes or no.                       |
| <i>PVCs allowed</i>                  | Indicates the number of allowable PVCs for use with this interface.  |
| <i>Interface MTU bytes</i>           | Indicates the size of user data contained in the frame relay frame.  |
| <i>Line access rate bps</i>          | Indicates the physical data rate of the frame relay interface.   |
| <i>CIR monitor adjust</i>            | Indicates the information rate value that is used to calculate the burst rate above the configured CIR when CIR monitoring is enabled. |
| <i>Timer T1 seconds</i>              | Indicates the rate that the frame relay interface performs a sequence number exchange with management.                                 |
| <i>LMI N2 threshold</i>              | Indicates the amount of management event errors that resets the frame relay interface.   |
| <i>LMI N3 error threshold window</i> | Indicates the number of events that the management window monitors.  |
| <i>Counter N1 increments</i>         | Indicates the time when the frame relay interface queries the management for PVC status.   |
| <i>Current receive sequence</i>      | Indicates the current receive sequence number that the frame relay interface received from management.                                 |
| <i>Current transmit sequence</i>     | Indicates the current transmit sequence number that the frame relay interface sent to management.                                      |

|                                 |   |
|---------------------------------|---|
| <i>Total status enquiries</i>   | Indicates the total number of inquiries that management made concerning the status of the frame relay interface.                        |
| <i>Total status responses</i>   | Indicates the total number of responses that frame relay interface received from management in response to management status enquiries. |
| <i>Total sequence requests</i>  | Indicates the total number of sequence number exchanges that the frame relay interface made with management.                            |
| <i>Total sequence responses</i> | Indicates the total number of sequence number responses received in response to management sequence number exchange.                    |
| <i>Total PVC allowed</i>        | Indicates the number of allowable PVCs (including orphans) for use with this interface.   |
| <i>Total PVC configured</i>     | Indicates the total number of currently configured PVCs for this interface.   |
| <i>Total PVC active</i>         | Indicates the number of active PVCs on this interface.  |
| <i>Total PVC congested</i>      | Indicates the number of PVCs that are throttled down because of congestion within the network.  |
| <i>Total PVC left net</i>       | Indicates the total number of PVCs that are no longer on the network.   |
| <i>Total PVC join net</i>       | Indicates the total number of PVCs that joined the network.   |



## permanent-virtual-circuit

Displays general link layer statistics and configuration information for all configured PVCs on the frame relay interface.

Example: **list permanent-virtual-circuit**

```
Maximum PVCs allowable = 64
Total PVCs configured = 3
```

| <u>Circuit#</u> | <u>Circuit Name</u> | <u>Orphan Circuit</u> | <u>Type/State</u> | <u>Frames Transmitted</u> | <u>Frames Received</u> |
|-----------------|---------------------|-----------------------|-------------------|---------------------------|------------------------|
| 16              | Unassigned          | No                    | P/A               | 7782                      | 1924                   |
| 20              | Boston              | Yes                   | P/A               | 589                       | 4563                   |
| 100             | PPP Circuit         | No                    | P/A               | 9629                      | 270                    |

```
A - Active      I - Inactive
P - Permanent  M - Multicast  C - Congested
```

*Circuit#* Indicates the number of the PVC.

*Circuit name* Indicates the ASCII designation of the configured PVC.

*Orphan Circuit* Indicates whether the PVC is a non-configured circuit (yes or no).

*State* Indicates the state of the circuit: A (active), I (inactive), P (Permanent), M (Multicast), or C (congested).

*Frames/Bytes Transmitted* Indicates how many frames and bytes this PVC has transmitted.

*Frames/Bytes Received* Indicates how many frames and bytes this PVC has received.

## Exit

Return to the previous prompt level.

**Syntax:** exit

Example: **exit**

## Frame Relay Interfaces and the GWCON Interface Command

While frame relay interfaces have a console process for monitoring purposes, bridging routers also display complete statistics for installed interfaces when you use the **interface** command from the GWCON environment. (For more information on the **interface** command, refer to the GWCON chapter in the *System Software Guide*.)

### Statistics Displayed For Frame Relay Interfaces

The following statistics are displayed when you execute the **interface** command from the GWCON environment for frame relay interfaces:

```

                Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec   Passed   Failed    Failed
1  1  FR/0             1001620  5D      0         0          0

Frame Relay MAC/data-link on SCC Serial Line interface

Adapter cable:           RS232  RISC Microcode Revision:           2

V.24 circuit: 105 106 107 108 109 125 141
Nicknames:   RTS CTS DSR DTR DCD RI  LL
RS-449:      RS  CS  DM  TR  RR  IC  LL
State:       ON  ON  ON  ON  ON  --- ---

Line speed:           unknown
Last port reset:     15 seconds ago

Input frame errors:
CRC error              0  alignment (byte length)           0
missed frame          0  too long (> 2062 bytes)           0
aborted frame         0  DMA/FIFO overrun                   0
L & F bits not set    0
Output frame counters:
DMA/FIFO underrun errors 0  Output aborts sent                 0
```

The fields in the previous examples are explained below.

*Nt*                                   Global network number.

*Nt'*                                  Global network prime number.

*Interface*                           Interface name and its instance number.

|                                   |  |
|-----------------------------------|--|
| <i>CSR</i>                        | Command and status register addresses.   |
| <i>Self-Test: Passed</i>          | Number of self-tests that succeeded.   |
| <i>Self-Test: Failed</i>          | Number of self-tests that failed.  |
| <i>Maintenance: Failed</i>        | Number of maintenance failures.  |
| <i>Adapter cable</i>              | Type of cable.   |
| <i>RISC Microcode Revision</i>    | Microcode revision level.  |
| <i>Line speed:</i>                | External clocking rate.  |
| <i>Last port reset:</i>           | Number of seconds since last port reset.   |
| <i>CRC error</i>                  | Received cyclic redundancy check does not match transmitted CRC.   |
| <i>alignment (byte length)</i>    | Count of frame alignment errors.   |
| <i>missed frame</i>               | Count of missed frames.  |
| <i>too long (&gt; 2062 bytes)</i> | Count of frames longer than 2062 bytes.  |
| <i>aborted frame</i>              | Count of aborted frames.   |
| <i>DMA/FIFO overrun</i>           | Number of times the router was unable to keep up with data being received because the receive buffer was full. |
| <i>L &amp; F bits not set</i>     | Count of last and first bits not set.  |
| <i>DMA/FIFO underrun errors</i>   | Number of times the router failed to transmit characters when the transmit device was ready.                   |



---

## Configuring Point-to-Point Protocol Interfaces

This chapter describes how to configure Point-to-Point Protocol (PPP) interfaces in the router.

For more information about PPP interfaces and configurations, refer to the *Routing Protocols Reference Guide*.

### Accessing the Interface Configuration Process

Follow the procedure described in the Chapter 1 to access the interface configuration process for the interface described in this chapter.

**Note:** After you access the interface configuration process, you may begin entering configuration commands. Whenever you make a change to a user-configurable interface parameter, you must restart the router for this change to take effect.

### Point-to-Point Configuration Commands

Table 8–1 summarizes the PPP configuration commands. The sections that follow explain these commands. Enter the commands at the `PPP config>` prompt.

**Table 8–1 Point-to-Point Configuration Command Summary**

| Command         | Function   |
|-----------------|--|
| <b>? (Help)</b> | Displays all the Point-to-Point commands or lists the options for specific commands.   |
| <b>List</b>     | Lists all information related to the point-to-point interfaces protocols, parameters, and options.                                   |
| <b>Set</b>      | Sets HDLC parameters, LCP options and parameters, IPCP options, BNCP options, PAP parameters, PAP IDs/passwords, and NCP parameters. |
| <b>Exit</b>     | Exits the PPP configuration process and returns to the <code>Config&gt;</code> prompt.   |

## Help (?)

List the commands that are available from the current prompt level. You can also enter `?` after a specific command name to list its options.

**Syntax:** `?`

Example: `?`

```
LIST
SET
EXIT
```

Example: `list ?`

```
ALL
HDLC
LCP
IPCP
BNCP
PARAMETERS
```

## List

Display information related to the point-to-point interface and its protocol parameters and options.

**Syntax:** `list` `all`  
`bncp`  
`hdlc`  
`ipcp`  
`lcp`  
`parameters`

### all

Lists all options and parameters related to the point-to-point interface.

Example: `list all`

```
Maximum frame size in bytes = 2048
Encoding: NRZ
Idle State: Flag
Internal Clock Speed: 0

Transmit Delay Counter: 0

LCP Parameters
-----
Config Request Tries:    20   Config Nak Tries:    10
Terminate Tries:        10   Retry Timer:         3000

LCP Options
-----
Max Receive Unit:       2048   Magic Number:        Yes

NCP Parameters
-----
Config Request Tries:    20   Config Nak Tries:    10
Terminate Tries:        10   Retry Timer:         3000

IPCP Options
-----
IPCP Compression:              None
IP Address:                     Send, Request
```

**Note:** This example shows all possible options and parameters.

The following section explains the information displayed by the **list all** command.

|                                    |  |
|------------------------------------|--|
| <i>Maximum frame size in bytes</i> | Maximum frame size that can be sent over the point-to-point link.  |
| <i>Encoding</i>                    | HDLC transmission encoding scheme, either NRZ (non-return to zero) or NRZI (non-return to zero inverted).                            |
| <i>Idle State</i>                  | Bit pattern, either Flag or Mark, transmitted on the point-to-point link when the interface is not transmitting data.                |
| <i>Internal Clock Speed</i>        | Speed of the transmit and receive clock lines.   |
| <i>Transmit Delay Counter</i>      | Period of time set to elapse between the transmission of each frame.   |
| <i>LCP Parameters</i>              |  |
| <i>Config Request Tries</i>        | Number of times LCP sends <i>configure-request</i> packets to a peer station while attempting to open a PPP link.                    |
| <i>Terminate Tries</i>             | Number of times LCP sends <i>terminate-request</i> packets to a peer station to close a PPP link.                                    |
| <i>Config Nak Tries</i>            | Number of times LCP sends <i>configure-nak</i> (nak=not acknowledged) packets to a peer station while attempting to open a PPP link. |
| <i>LCP Options</i>                 |  |
| <i>Max Receive Unit</i>            | Maximum packet size that the link handles.   |
| <i>Magic Number</i>                | Indicates whether the “magic number” loopback detection option was enabled or disabled.  |
| <i>NCP Parameters</i>              |  |
| <i>Config Request Tries</i>        | Number of times NCP sends <i>configure-request</i> packets to a peer station while attempting to open a PPP link.                    |



|                         |  |
|-------------------------|--|
| <i>Terminate Tries</i>  | Number of times NCP sends <i>terminate-request</i> packets to a peer station to close a PPP link.  |
| <i>Config Nak Tries</i> | Number of times NCP sends <i>configure-nak</i> (nak=not acknowledged) packets to a peer station while attempting to open a PPP link.   |
| <i>Retry timer</i>      | Amount of time, in milliseconds, that elapses before LCP's transmission of <i>configure-request</i> (to open the link) and <i>terminate-request</i> (to close the link) packets times out. Expiration of this timer causes a "timeout" and the halting of <i>configure-request</i> and <i>terminate-request</i> packet transmission. |
| <i>IPCP Options</i>     |  |
| <i>IPCP Compression</i> | Displays whether or not the PPP handler accepts compressed data. PPP supports Van Jacobson Compressed TCP/IP. Enable this option when the point-to-point link is running at a low baud rate.   |
| <i>IP Address</i>       | Displays whether or not IPCP is configured to send the local IP address to the remote end of the link. Also displays whether or not IPCP is configured to request the IP address from the remote end of the link.  |

## **bncp**

Lists the Bridging Network control protocol options.

Example: **list bncp**

```

BNCP Options
-----
Tinygram Compression: DISABLED

```

### *BNCP Options*

*Tinygram Compression:* Indicates whether BNCP Tinygram compression is enabled or disabled.

## hdlc

Lists parameters related to the High-level Data Link Control (HDLC) protocol. These fields are described under the **list all** command.

Example: **list hdlc**

```
Maximum frame size in bytes = 2048
Encoding: NRZ
Idle State: Flag
Internal Clock Speed: 0

Transmit Delay Counter: 0
```

## ipcp

Lists the Internet Protocol control protocol options. These fields are described under the **list all** command.

Example: **list ipcp**

```
IPCP Options
-----
IPCP Compression:          None
IP Address:               Don't Send or Request
```

## lcp

Lists parameters and options for the Link Control Protocol. These fields are described under the **list all** command.

Example: **list lcp**

```
LCP Parameters
-----
Config Request Tries:      20   Config Nak Tries:      10
Terminate Tries:          10   Retry Timer:           3000

LCP Options
-----
Max Receive Unit:         2048  Magic Number:          Yes
```

## parameters

Lists parameters for all Network Control Protocols. These parameters are described under the **list all** command.

Example: **list parameters**

#### NCP Parameters

```
-----  
Config Request Tries:    20   Config Nak Tries:    10  
Terminate Tries:        10   Retry Timer:        3000
```

## Set

Set HDLC parameters, LCP options and parameters, IPCP options, BNCP options, and NCP parameters. Parameters affect only the interface that you are configuring. Options are active across the entire link.

**Note:** Values immediately following the command option prompts reflect the current setting of that option. They are not always the default values.

**Syntax:** set        bncp  
                  hdlc encoding . . .  
                  hdlc idle . . .  
                  hdlc transmit delay . . .  
                  ipcp . . .  
                  lcp . . .  
                  pap ids/passwords  
                  pap parameters  
                  parameters . . .  
                  hdlc cable . . .

## bncp

Sets Bridging Network Control Protocol (BNCP) parameters.

Example: **set bncp**

```
TINYGRAM COMPRESSION [no]:
```

*Tinygram  
Compression*

Specifies whether or not Tinygram Compression is used. This options is useful for some protocols, such as Local Area Terminal (LAT), that are prone to problems when bridged over low-speed (64 KBPS and below) lines. In these protocols, zeroes are added between the data and the frame checksum to pad the Protocol Data Unit (PDU) to the minimum size. Tinygram compression removes the zeroes and preserves the frame checksum at the transmitting end. At the receiving end, it restores the packet to the minimum length.

#### **hdlc encoding *NRZ* or *NRZI***

Sets the HDLC transmission encoding scheme for this interface (or port) to either NRZ (non-return to zero) or NRZI (non-return to zero inverted). The default is NRZ.

Example: `set hdlc encoding nrz`

#### **hdlc idle *flag* or *mark***

Sets the data link idle state to either Flag or Mark. The default is Flag.

Example: `set hdlc idle flag`

#### **hdlc transmit-delay *microseconds***

Sets the period of time, in microseconds, between the transmission of each frame. For all platforms, the default is 0.

Example: `set hdlc transmit-delay 30`

#### **ipcp**

Sets all Internet Protocol control protocol options for the link. Options are settings that are active across the entire link.

Example: `set ipcp`

```
IP COMPRESSION [no]:  
Send our IP address [no]:  
Request their IP address [no]:
```

*IPCP compression* Selects whether or not the PPP handler accepts compressed data. PPP supports Van Jacobson Compressed TCP/IP (RFC 1144). Enable this option when the point-to-point link is running at a low baud rate.

Setting this value to Yes enables compression. Setting this value to No disables compression. The default is No.

*Send our IP address* Specifies whether or not to send the local IP address to the remote end of the link. Set this option to Yes if the other end of the link requires the IP address. In either case, the PPP software sends the local IP address if the other end of the link requests it.

*Request their IP address* Specifies whether or not to request the IP address from the remote end of the link. If the PPP software receives the remote IP address, it displays the address with the PPP monitoring statistics.

### **lcp options or parameters**

Sets the Link Control Protocol options and parameters for the PPP link. Options are active across the entire link. Parameters affect only the specific interface.

Example: **set lcp options**

```
Maximum Receive Unit (bytes) [2048]?  
Magic Number [yes]:
```

*Maximum receive unit* Sets the maximum packet size of the information field that can be transferred in a single datagram. The range is 576 to 4089 bytes. The default is 2048.

*Magic number* Specifies whether or not the magic number option is enabled. Magic number provides a way to detect looped-back links in serial line configurations. When this option is enabled, the link uses the system clock as a random number generator.

When the LCP receives a Configure-Request with a magic number present (the magic number option is enabled), it compares the received magic number with the magic number in the last Configure-Request sent to the peer. If the two magic numbers are different, the link is not considered looped back. If the two magic numbers are the same, the PPP handler attempts to bring the link down and up again to renegotiate magic numbers.

Setting this value to Yes enables the magic number option. Setting this value to No disables the option. The default is Yes.

**Example: set lcp parameters**

```
Config tries [20]?  
NAK tries [10]?  
Terminate tries [10]?  
Retry timer (mSec) [3000]?
```

|                        |  |
|------------------------|--|
| <i>Config tries</i>    | <p>Sets the number of configure-request packets that LCP sends to a peer station to attempt to open a PPP link. The range is 1 to 100. The default is 20.</p> <p>The retry timer starts after the first configure-request packet is transmitted. This is done to guard against packet loss.</p>  |
| <i>NAK tries</i>       | <p>Sets the number of configure-nak (nak = not acknowledged) packets that LCP sends to a peer station while attempting open a PPP link. The range is 1 to 100. The default is 10.</p> <p>Upon receiving configure-request packets with unacceptable configuration options, LCP sends configure-nak packets. These packets are sent to refuse the offered configuration options and to suggest modified, acceptable values.</p> |
| <i>Terminate tries</i> | <p>Sets the number terminate-request packets that LCP sends to a peer station to close a PPP link. The range is 1 to 100. The default is 10.</p> <p>The retry timer starts after the first terminate-request packet is transmitted. This is done to guard against packet loss.</p>   |
| <i>Retry timer</i>     | <p>Sets the amount of time, in milliseconds, that elapses before LCP's transmission of configure-request (to open the link) and terminate-request (to close the link) packets is timed out. Expiration of this timer causes a timeout and the halting of configure-request and terminate-request packet transmission. The range is 200 to 30000 milliseconds. The default is 3000 milliseconds.</p>                            |

## **pap ids/passwords**

Sets the Password Authentication Protocol local and remote IDs/passwords. IDs and passwords affect only the specific interface.

Example: **set pap local**

```
Local ID []:  
Local Password []:
```

*Local ID*                    A text string that specifies the identifier of the local station. PAP sends this string to the remote station to identify itself. The string can contain any combination of up to 255 alphanumeric characters.

*Local Password*            A text string that specifies the password of the local station. PAP sends this string to the remote station to authenticate its identifier. The string can be any combination of up to 255 alphanumeric characters.

Example: **set pap remote**

```
Remote ID []:  
Remote Password []:
```

*Remote ID*                    A text string that specifies the identifier of the remote station. When PAP receives an identifier string from the remote station, it compares the received string with this string. A mismatch results in authentication failure. The string can contain any combination of up to 255 alphanumeric characters.

*Remote Password*            A text string that specifies the password of the remote station. When PAP receives a password string from the remote station, it compares the received string with this string. A mismatch results in authentication failure. The string can contain any combination of up to 255 alphanumeric characters.



## **pap parameters**

Sets the Password Authentication Protocol parameters. These parameters affect only the specific interface for which you are setting them.

Example: **set pap parameters**

```
Request tries [20]?  
Retry timer (mSec) [3000]?  
Request timer (mSec) [15000]?
```

*Request tries* Sets the number of authentication-request packets PAP sends to a peer station to attempt to authenticate the remote station. The range is 1 to 100. The default is 20.

*Retry timer* Sets the amount of time, in milliseconds, that elapses before PAP attempts to authenticate the remote station again. The range is 200 to 30000 milliseconds. The default is 3000 milliseconds.

*Request timer* Sets the amount of time, in milliseconds, that elapses before PAP assumes an authentication request is considered to have failed and PAP terminates the link. The range is 200 to 150000 milliseconds. The default is 15000 milliseconds.

## **parameters**

Sets parameters for all Network Control Protocols.

Example: **set parameters**

```
Config tries [20]?  
NAK tries [10]?  
Terminate tries [10]?  
Retry timer (mSec) [3000]?
```

|                        |   |
|------------------------|---|
| <i>Config tries</i>    | <p>Sets the number of configure-request packets that NCP sends to a peer station to attempt to open a PPP link. The range is 1 to 100. The default is 20.</p> <p>This action indicates the desire to open an LCP connection with a specified set of configuration options. The retry timer starts after a configure-request packet is transmitted. This is done to guard against packet loss.</p>   |
| <i>NAK tries</i>       | <p>Sets the number of configure-nak (nak = not acknowledged) packets that NCP sends to a peer station while attempting open a PPP link. The range is 1 to 100. The default value is 10.</p> <p>Upon receiving configure-request packets with some unacceptable configuration options, NCP sends configure-nak packets. These packets are sent to refuse the offered configuration options and to suggest modified, acceptable values.</p> |
| <i>Terminate tries</i> | <p>Sets the number of terminate-request packets that NCP sends to a peer station to close a PPP link. The range is 1 to 100. The default value is 10.</p> <p>This action indicates the desire to close an NCP connection. The retry timer is started after a terminate-request packet is transmitted. This is done to guard against packet loss.</p>  |
| <i>Retry timer</i>     | <p>Sets the amount of time, in milliseconds, that elapses before NCP's transmission of configure-request (to open the link) and terminate-request (to close the link) packets is timed out. Expiration of this timer causes a timeout and the halting of configure-request and terminate-request packet transmission. The range is 200 to 30000 milliseconds. The default is 3000 milliseconds.</p>                                       |

## Exit

Return to the Config> prompt.

**Syntax:** `exit`

Example: `exit`



---

## Monitoring Point-to-Point Protocol Interfaces

This chapter describes how to monitor specific Point-to-Point Protocol interfaces in the router.

For more information on Point-to-Point interfaces and configurations, refer to the *Routing Protocols Reference Guide*.

### Accessing the Interface Console Process

Follow the procedure described in Chapter 1 to access the interface console process for the interface described in this chapter. After you access the desired interface console process, you may begin entering console commands.

### Point-to-Point Console Commands

This section explains the Point-to-Point console commands. Enter the commands at the `PPP>` prompt.

**Table 9-1 Point-to-Point Console Command Summary**

| Command  | Function   |
|----------|--|
| ? (Help) | Displays all the Point-to-Point commands or lists subcommand options for specific commands (if available). |
| Clear    | Clears all statistics from point-to-point interfaces.  |
| List     | Displays information and counters related to the point-to-point interface and PPP parameters and options.  |
| Exit     | Exits the Point-to-Point console process.  |

## ? (Help)

List the available commands. You can also enter ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
CLEAR
LIST
EXIT
```

Example: **list** ?

```
ALL
CONTROL
ERRORS
IP
DN
IPX
AP2
OSI
IPCP
DNCP
IPXCP
BNCP
ATCP
OSICP
LCP
```

## Clear

Clear all statistics from point-to-point interfaces.

**Syntax:** clear

Example: **clear**

## List

Display information and counters related to the point-to-point interface and PPP parameters and options. The **list all** command displays all information related to PPP. You can display specific groups of information by listing the information for that group only.

**Syntax:**    list        all  
                          ap2  
                          atcp  
                          bncp  
                          control . . .  
                          dn  
                          dncp  
                          errors  
                          ip  
                          ipcp  
                          ipx  
                          ipxcp  
                          lcp  
                          osi  
                          osicp  
                          pap

### all

Lists all information and counters related to the point-to-point interface and PPP options and parameters. While the output displayed is shown following the command example below, specific fields that are defined under the **list** command that displays that specific statistical group. For example, Error Type fields are explained under the **list error** command.

Example: list all

```
Version:          1
LCP State:       Req Sent
Previous State:  Listen
Time Since Change: 18 seconds

LCP Option          Local          Remote
-----
Max Receive Unit:  2048            1500
Async Char Mask:   FFFFFFFF          FFFFFFFF
Authentication:    None              None
Magic Number:      8F202AE1          None
Protocol Compr:    No                No
Addr/Cntl Compr:   No                No
32-Bit Checksum:   No                No

IPCP State:        Open
Previous State:    Ack Sent
Time Since Change: 2 hours, 15 minutes and 53 seconds

IPCP Option          Local          Remote
-----
IP Address           128.189.209.20  None
Compression Slots    None             None

DNCP State:         Closed
Previous State:     Closed
Time Since Change:  5 hours, 15 minutes and 55 seconds

IPXCP State:        Open
Previous State:     Request Sent
Time Since Change:  3 hours, 15 minutes and 55 seconds
BNCP State:         Closed
Previous State:     Closed
Time Since Change:  5 hours, 15 minutes and 56 seconds

BNCP Option          Local          Remote
-----
Tinygram Compression  DISABLED        DISABLED

Source-route Info:
Remote side does not support source-route bridging

ATCP State:         Open
Previous State:     Request Sent
Time Since Change:  5 hours, 15 minutes and 57 seconds
AppleTalk Address Info:
Common network number = 12
Local node ID = 49
Remote node ID = 86

OSICP State:        Closed
```



Previous State: Closed  
Time Since Change: 5 hours, 15 minutes and 58 seconds

| LCP Statistic | In   | Out   |
|---------------|------|-------|
| -----         | --   | ---   |
| Packets:      | 226  | 2880  |
| Octets:       | 6780 | 40320 |
| Cfg Req:      | 0    | 2880  |
| Cfg Ack:      | 0    | 0     |
| Cfg Nak:      | 0    | 0     |
| Cfg Rej:      | 0    | 0     |
| Term Req:     | 0    | 0     |
| Term Ack:     | 0    | 0     |
| Echo Req:     | 113  | 113   |
| Echo Resp:    | 113  | 113   |
| Disc Req:     | 0    | 0     |
| Code Rej:     | 0    | 0     |

| IPCP Statistic | In  | Out |
|----------------|-----|-----|
| -----          | --  | --- |
| Packets:       | 5   | 0   |
| Octets:        | 100 | 170 |
| Prot Rejects:  | 0   | -   |

| IP Statistic  | In    | Out   |
|---------------|-------|-------|
| -----         | --    | ---   |
| Packets:      | 3456  | 3456  |
| Octets:       | 27648 | 27648 |
| Prot Rejects: | 0     | -     |

| DNCP Statistic | In | Out |
|----------------|----|-----|
| -----          | -- | --- |
| Packets:       | 0  | 0   |
| Octets:        | 0  | 0   |
| Prot Rejects:  | 0  | -   |

| DN Statistic  | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Prot Rejects: | 0  | -   |

| IPXCP Statistic | In | Out |
|-----------------|----|-----|
| -----           | -- | --- |
| Packets:        | 0  | 0   |
| Octets:         | 0  | 0   |
| Prot Rejects:   | 0  | -   |

| IPX Statistic | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Prot Rejects: | 0  | -   |

```

BNCP Statistic      In          Out
-----
Packets:           0           0
Octets:            0           0
Prot Rejects:      0           -

ATCP Statistic      In          Out
-----
Packets:           349         351
Octets:            128488     129412
Prot Rejects:      0           -

AP2 Statistic       In          Out
-----
Packets:           349         351
Octets:            128488     129412
Prot Rejects:      0           -

OSICP Statistic     In          Out
-----
Packets:           0           0
Octets:            0           0
Prot Rejects:      0           -

OSI Statistic       In          Out
-----
Packets:           0           0
Octets:            0           0
Prot Rejects:      0           -

Error Type          Count       Last One
-----
Bad Address:        0           0
Bad Control:        0           0
Unknown Protocol:   0           0
Invalid Protocol:   0           0
Config Timeouts:    145         -
Terminate Timeouts: 0           -

```

## ap2

Lists AppleTalk Phase 2 statistics for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list ap2**

```

AP2 Statistic      In          Out
-----
Packets:           349         351
Octets:            128488     129412
Prot Rejects:      0

```

## atcp

Lists statistics for the AppleTalk control protocol. These fields are the same as those described under the **list ip** command.

Example: **list atcp**

| ATCP Statistic | In | Out |
|----------------|----|-----|
| -----          | -- | --- |
| Packets:       | 0  | 0   |
| Octets:        | 0  | 0   |
| Prot Rejects:  | 0  | -   |

## bncp

Lists statistics for the Bridging Network control protocol. These fields are the same as those described under the **list ip** command.

Example: **list bncp**

| BNCP Statistic | In | Out |
|----------------|----|-----|
| -----          | -- | --- |
| Packets:       | 0  | 0   |
| Octets:        | 0  | 0   |
| Prot Rejects:  | 0  | -   |

**control**    **lcp**  
              **pap**  
              **ipcp**  
              **dncp**  
              **ipxcp**  
              **bncp**  
              **atcp**  
              **osicp**

Lists information and counters related to the specified control protocol.

Example: **list control lcp**

```
LCP State:          Listen
Previous State:     Req Sent
Time Since Change:  8 seconds
```

| LCP Option        | Local    | Remote   |
|-------------------|----------|----------|
| -----             | -----    | -----    |
| Max Receive Unit: | 2048     | 1500     |
| Async Char Mask:  | FFFFFFFF | FFFFFFFF |
| Authentication:   | None     | None     |
| Magic Number:     | B87DA37F | None     |
| Protocol Compr:   | No       | No       |
| Addr/Cntl Compr:  | o        | No       |
| 32-Bit Checksum:  | No       | No       |

#### *LCP State*

Displays the current state of the point-to-point link. These states include the following:

- **Open** – Indicates that a connection was made and data can be sent. The retry timer does not run in this state.
- **Closed** – Indicates that the link is down and there is no attempt being made to open it. In this state, all connection requests from peers are rejected.
- **Listen** – Indicates that the link is down and there is no attempt being made to open it. In contrast to the CLOSED state, all connection requests from peers are accepted.
- **Request-Sent** – Indicates that an active attempt is being made to open the link. A Configure-request packet was sent but a Configure-Ack was not yet received nor was one sent. The retry timer is running at this time.
- **Ack-Received** – Indicates that a Configure-request packet was sent and a Configure-Ack packet was received. The retry timer is still running since a Configure-Ack packet was not transmitted.

- **Ack-Sent** – Indicates that a Configure-Ack packet and a Configure-request packet were sent but a Configure-Ack packet was not received. The retry timer always runs in this state.
- **Closing** – Indicates that an attempt is being made to close the connection. A Terminate-request packet was sent but a Terminate-Ack packet was not received. The retry timer is running in this state.

|                                    |   |
|------------------------------------|---|
| <i>Previous State</i>              | Displays the state of the point-to-point link prior to the state displayed in the LCP State field. These states are the same as those described in the LCP State field. |
| <i>Time Since Change</i>           | Displays the amount of time the link is in the present state.   |
| <i>LCP Option</i>                  |   |
| <i>Max receive unit</i>            | Displays the maximum packet size set for both the local and remote end of the link.   |
| <i>Asyn character mask</i>         | Not currently supported. PPP accepts this option but ignore it.   |
| <i>Authentication</i>              | Not currently supported. PPP rejects this option if it is received.   |
| <i>Magic number</i>                | The current magic number for both the local and remote end of the link.   |
| <i>Protocol compression</i>        | Not currently supported. PPP rejects this option if it is received.   |
| <i>Address/Control compression</i> | Not currently supported. PPP rejects this option if it is received.   |
| <i>32-bit checksum</i>             | Not currently supported. PPP rejects this option if it is received.   |

Example: **list control pap**

```
PAP State:          Closed
Previous State:     Closed
Time Since Change:  53 minutes and 30 seconds
```

PAP Ids/Passwords  
-----

```
Local ID:          FOO
Local Password:    BAR
```

```
Remote ID:         FOO
Remote Password:   BAR
```

|                          |   |
|--------------------------|---|
| <i>PAP State</i>         | <p>Displays the current state of the authentications protocol. These states include the following:</p> <ul style="list-style-type: none"> <li>• <b>Closed</b> – Indicates that the link is down and there is no attempt being made to open it. This state indicates that authentication is not in progress.</li> <li>• <b>Closing</b> – Indicates that authentication has failed and the link is in the termination process.</li> <li>• <b>Listen</b> – Indicates that the local station is waiting for an authentication request from the remote station.</li> <li>• <b>Req Sent</b> – The local station has sent the authentication request containing the local ID and password. The remote station has not responded.</li> <li>• <b>Ack Rcvd</b> – The local station has received positive acknowledgement for its ID and password.</li> <li>• <b>Ack Sent</b> – The local station has received the remote station's ID and password and has sent acknowledgement.</li> <li>• <b>Opened</b> – Authentication is complete and link establishment is proceeding.</li> </ul> |
| <i>Previous State</i>    | <p>Displays the state of the pap protocol prior to the state displayed in the PAP State field. These states are the same as those described in <i>PAP State</i> above.</p>  |
| <i>Time Since Change</i> | <p>Displays the amount of time the link is in the present state.</p>  |
| <i>PAP Ids/Passwords</i> |   |
| <i>Local ID</i>          | <p>The identifier string sent by the local station in an authentication request packet.</p>   |

|                        |  |
|------------------------|--|
| <i>Local Password</i>  | The password string sent by the local station in an authentication request packet.                     |
| <i>Remote ID</i>       | The identifier string expected by the local station when an authentication request packet is received. |
| <i>Remote Password</i> | The password string expected by the local station when an authentication request packet is received.   |

Example: **list control ipcp**

```

IPCP State:          Listen
Previous State:      Closed
Time Since Change:   20 seconds

IPCP Option          Local          Remote
-----
IP Address           128.189.209.20   None
Compression Slots    None              None

```

The IPCP State fields are the same as those described under the **list control lcp** command.

#### *IPCP Option*

|                          |   |
|--------------------------|---|
| <i>IPCP Address</i>      | The IP address of the local and remote ends of the link, if available.                          |
| <i>Compression Slots</i> | The number IP headers saved for reference to determine the type of compression that is enabled. |

Example: **list control dnpcp**

```

DNCP State:          Closed
Previous State:      Closed
Time Since Change:   6 hours, 23 minutes and 37 seconds

```

The DNCP State fields are the same as those described under the **list control lcp** command.

Example: **list control ipxcp**

```

IPXCP State:         Closed
Previous State:      Closed
Time Since Change:   2 hours, 9 minutes and 2 seconds

```



The IPXCP State fields are the same as those described under the **list control lcp** command.

Example: **list control bncp**

```
BNCP State:          Closed
Previous State:      Closed
Time Since Change:   5 hours, 25 minutes and 3 seconds

BNCP Option          Local          Remote
-----
Tinygram Compression  DISABLED          DISABLED

Source-route Info:
Remote side does not support source-route bridging
```

The BNCP State fields are the same as those described under the **list control lcp** command.

#### *BNCP Option*

|                             |  |
|-----------------------------|--|
| <i>Tinygram Compression</i> | Displays whether or not Tinygram Compression is enabled or disabled on the local and remote ends of the link.              |
| <i>Source-route Info</i>    | Displays whether or not source route bridging is enabled for the local and remote ports that correspond to this interface. |

Example: **list control atcp**

```
ATCP State:          Closed
Previous State:      Closed
Time Since Change:   6 hours, 27 minutes and 7 seconds
AppleTalk Address Info:
Common network number = 12
Local node ID = 49
Remote node ID = 76
```

The ATCP State fields are the same as those described under the **list control lcp** command.

*AppleTalk  
Address Info*

|                              |  |
|------------------------------|--|
| <i>Common Network Number</i> | Displays the network number of the two ends of the point-to-point link. (You must statically configure both ends of the link to have the same network number.) |
| <i>Local Node ID</i>         | Displays the unique node number of the local end of the link.  |
| <i>Remote Node ID</i>        | Displays the unique node number of the remote end of the link.   |

Example: **list control osicp**

```
OSICP State:      Closed
Previous State:   Closed
Time Since Change: 6 hours, 28 minutes and 32 seconds
```

The OSICP State fields are the same as those described under the **list control lcp** command.

**dn**

Lists statistics related to DECnet packets for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list dn**

```
DN Statistic      In      Out
-----
Packets:          0        0
Octets:           0        0
Prot Rejects:     0        -
```

**dncp**

Lists statistics for the DECnet control protocol. These fields are the same as those described under the **list ip** command.

Example: `list dnmp`

| DNCP Statistic | In | Out |
|----------------|----|-----|
| -----          | -- | --- |
| Packets:       | 0  | 0   |
| Octets:        | 0  | 0   |
| Prot Rejects:  | 0  | -   |

## errors

Lists information related to all error conditions tracked by the PPP software.

Example: `list error`

| Error Type          | Count | Last One |
|---------------------|-------|----------|
| -----               | ----- | -----    |
| Bad Address:        | 0     | 0        |
| Bad Control:        | 0     | 0        |
| Unknown Protocol:   | 0     | 0        |
| Invalid Protocol:   | 0     | 0        |
| Config Timeouts:    | 0     | 0        |
| Terminate Timeouts: | 0     | 0        |

### *Error Type*

|                           |  |
|---------------------------|--|
| <i>Bad address</i>        | Displays the total number of bad addresses encountered over the point-to-point link.       |
| <i>Bad control</i>        | Displays the total number of bad control packets encountered over the point-to-point link. |
| <i>Unknown protocol</i>   | Displays the total number of unknown protocol packets encountered by the current link.     |
| <i>Invalid protocol</i>   | Displays the total number of invalid protocol packets encountered by the current link.     |
| <i>Config timeouts</i>    | Displays the total number configuration timeouts experienced by the link.                  |
| <i>Terminate timeouts</i> | Displays the total number of link termination timeouts experienced by the link.            |

## ip

Lists all information related to IP packets over the point-to-point link.

Example: **list ip**

| Ip Statistic  | In     | Out    |
|---------------|--------|--------|
| -----         | --     | ---    |
| Packets:      | 349    | 351    |
| Octets:       | 128488 | 129412 |
| Prot Rejects: | 0      |        |

#### *Ip Statistic*

- Packets* Displays the total number of IP packets transmitted (out) and received (in) over the current point-to-point interface.
- Octets* Displays the total number of bytes in octets transmitted and received over the current IP connection.
- Prot Rejects* Displays the total number of protocol-reject packets transmitted and received over the current point-to-point interface.

### **ipcp**

Lists IPCP statistics for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list ipcp**

| Icp Statistic | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Prot Rejects: | 0  |     |

### **ipx**

Lists IPX statistics for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list ipx**

| IPX Statistic | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Prot Rejects: | 0  | -   |

## ipxcp

Lists statistics for the IPX control protocol. These fields are the same as those described under the **list ip** command.

Example: **list ipxcp**

| IPXCP Statistic | In | Out |
|-----------------|----|-----|
| -----           | -- | --- |
| Packets:        | 0  | 0   |
| Octets:         | 0  | 0   |
| Prot Rejects:   | 0  | -   |

## lcp

Lists statistics for the Link Control Protocol.

Example: **list lcp**

| LCP Statistic | In | Out   |
|---------------|----|-------|
| -----         | -- | ---   |
| Packets:      | 0  | 3833  |
| Octets:       | 0  | 53662 |
| Cfg Req:      | 0  | 3833  |
| Cfg Ack:      | 0  | 0     |
| Cfg Nak:      | 0  | 0     |
| Cfg Rej:      | 0  | 0     |
| Term Req:     | 0  | 0     |
| Term Ack:     | 0  | 0     |
| Echo Req:     | 0  | 0     |
| Echo Resp:    | 0  | 0     |
| Disc Req:     | 0  | 0     |
| Code Rej:     | 0  | 0     |

### *LCP Statistic*

#### *Packets*

Displays the total number of packets transmitted (out) and received (in) over the current point-to-point interface.

#### *Octets*

Displays the total number of bytes in octets transmitted and received over the current point-to-point interface.

#### *Cfg Req*

Displays the total number of configure-request packets transmitted and received over the current point-to-point interface.

|                 |   |
|-----------------|---|
| <i>Cfg Ack</i>  | Displays the total number of configure-ack (acknowledged) packets transmitted and received over the current point-to-point interface.     |
| <i>Cfg Nak</i>  | Displays the total number of configure-nak (not acknowledged) packets transmitted and received over the current point-to-point interface. |
| <i>Cfg Rej</i>  | Displays the total number of configure-reject packets transmitted and received over the current point-to-point interface.                 |
| <i>Term Req</i> | Displays the total number of terminal-request packets transmitted and received over the current point-to-point interface.                 |
| <i>Term Ack</i> | Displays the total number of terminal-ack (acknowledged) packets transmitted and received over the current point-to-point interface.      |
| <i>Echo Req</i> | Displays the total number of echo-request packets transmitted and received over the current point-to-point interface.                     |
| <i>Disc Req</i> | Displays the total number of discard-request packets transmitted and received over the current point-to-point interface.                  |
| <i>Code Rej</i> | Displays the total number of code-reject packets transmitted and received over the current point-to-point interface.                      |

## osi

Lists OSI statistics for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list osi**

| OSI Statistic | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Prot Rejects: | 0  | -   |

## osicp

Lists statistics for the OSI control protocol. These fields are the same as those described under the **list ip** command.

Example: **list osicp**

| OSICP Statistic | In | Out |
|-----------------|----|-----|
| -----           | -- | --- |
| Packets:        | 0  | 0   |
| Octets:         | 0  | 0   |
| Prot Rejects:   | 0  | -   |

## pap

Lists statistics for the Password Authentication Protocol.

Example: **list pap**

| PAP Statistic | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Auth Req:     | 0  | 0   |
| Auth Ack:     | 0  | 0   |
| Auth Nak:     | 0  | 0   |

*Packets* Displays the total number of PAP packets transmitted (out) and received (in) over the current point-to-point interface.

*Octets* Displays the total number of bytes of PAP in octets transmitted and received over the current point-to-point interface.

*Auth Req* Displays the total number of authentication packets transmitted and received over the current point-to-point interface.

*Auth Ack* Displays the total number of acknowledgement packets transmitted and received over the current point-to-point interface.

*Auth Nak* Displays the total number of negative acknowledgement packets transmitted and received over the current point-to-point interface.

## Exit

Return to the CGWCON prompt (+).

**Syntax:** `exit`

Example: `exit`



## Point-to-Point Protocol Interfaces and the GWCON Interface Command

While point-to-point interfaces have their own console processes for monitoring purposes, bridging routers also display complete statistics for installed network interfaces when you use the **interface** command from the GWCON environment.

Example: **interface 2**

```

                                Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec      Passed    Failed    Failed
4  4  PPP/0          80002000  4C          0         10         0

  Point to Point MAC/data-link on Serial Line interface

  Level converter:          RS-232/V.35  Adapter cable:
  V.35 DTE

  V.24 circuit: 105 106 107 108 109 125 141
  Nicknames:   RTS CTS DSR DTR DCD RI
  PUB 41450:   CA CB CC CD CF CE
  State:       ON  ON  ON  ON  ON  OFF OFF

  Line speed:          unknown
  Last port reset:    1 minute, 11 seconds ago

  Input frame errors:
    CRC error          0      alignment (byte length)      0
  too short (< 2 bytes) 0      too long (> 2180 bytes)      0
  aborted frame        0      DMA/FIFO overrun            0
  Output frame counters:
    DMA/FIFO underrun errors 0      Output aborts sent          0

```

The following table describes the output.

|                         |  |
|-------------------------|--|
| <i>Nt</i>               | Indicates the serial line interface number.                          |
| <i>Nt'</i>              | Indicates the serial line interface number.                          |
| <i>Interface</i>        | Indicates the interface type and its instance number.                |
| <i>CSR</i>              | Indicates the command and status register addresses of base network. |
| <i>Vec</i>              | Indicates the interrupt vector address.                              |
| <i>Self-Test Passed</i> | Indicates the number of self-tests that succeeded.                   |

|                                      |   |
|--------------------------------------|---|
| <i>Self-Test Failed</i>              | Indicates the number of self-tests that failed.   |
| <i>Maintenance:<br/>Failed</i>       | Indicates the number of maintenance failures.   |
| <i>Adapter cable:</i>                | Indicates the type of adapter cable that the level converter is using.  |
| <i>V.24 circuit:</i>                 | Indicates the circuit numbers as identified by V.24 specifications.   |
| <i>Nicknames</i>                     | Indicates the common names for the circuits.  |
| <i>PUB 41450</i>                     | Indicates the PUB 41450 names for the circuits.   |
| <i>State</i>                         | Indicates the current state of the circuits (ON or OFF).  |
| <i>Line speed</i>                    | Indicates the transmit clock speed (approximate).   |
| <i>Last port reset</i>               | Indicates the length of time since the port was reset.  |
| <i>Input frame<br/>errors:</i>       |   |
| <i>CRC error</i>                     | Indicates the number of packets received that contained checksum errors and as a result were discarded.                     |
| <i>Alignment<br/>(byte length)</i>   | Indicates the number of packets received that were not an even multiple of 8 bits in length and as a result were discarded. |
| <i>too short<br/>(&lt;2 bytes)</i>   | Indicates the number of packets received that were less than 2 bytes in length and as a result were discarded.              |
| <i>too long<br/>(&gt;nnnn bytes)</i> | Indicates the number of packets received that were greater than the configured frame size and as a result were discarded.   |
| <i>aborted frame</i>                 | Indicates the number of packets received that were aborted by the sender or a line error.                                   |

Output frame  
counters:

*DMA/FIFO  
underrun  
errors*                    Indicates the number of times the serial interface card  
did not retrieve data fast enough from the system  
packet buffer memory to transmit them onto the  
network.

*Output aborts  
sent*                    Indicates the number of transmissions that were  
aborted as requested by upper-level software.

Example: + interface 1

| Nt | Nt' | Interface | CSR     | Vec | Self-Test<br>Passed | Self-Test<br>Failed | Maintenance<br>Failed |
|----|-----|-----------|---------|-----|---------------------|---------------------|-----------------------|
| 1  | 1   | PPP/0     | 1001620 | 5D  | 1                   | 705                 | 0                     |

Point to Point MAC/data-link on SCC Serial Line interface

Adapter cable:                    V.35 DTE    RISC Microcode Revision:                    2

V.24 circuit: 105 106 107 108 109 125 141

Nicknames:    RTS CTS DSR DTR DCD RI LL

PUB 41450:    CA CB CC CD CF CE

State:        ON ON ON ON ON OFF OFF

Line speed:                    unknown

Last port reset:                18 minutes, 19 seconds ago

Input frame errors:

CRC error                        0    alignment (byte length)                    2

missed frame                    0    too long (> 2182 bytes)                    0

aborted frame                    0    DMA/FIFO overrun                            0

L & F bits not set                0

Output frame counters:

DMA/FIFO underrun errors        0    Output aborts sent                            0



---

## Configuring Point-to-Point Protocol over Frame Relay Pseudo Interfaces

This chapter describes how to configure Point-to-Point Protocol over Frame Relay (PPP-FR) pseudo-interfaces in the router.

For more information about PPP and Frame Relay interfaces and configurations, refer to the *Routing Protocols Reference Guide*.

### Accessing the Interface Configuration Process

Follow the procedure described in the Chapter 1 to access the interface configuration process for the interface described in this chapter.

**Note:** After you access the interface configuration process, you may begin entering configuration commands. Whenever you make a change to a user-configurable interface parameter, you must restart the router for this change to take effect.

### Configuration Procedures

This section describes how to configure your router for Point-to-Point Protocol over Frame Relay. Specifically, the tasks you need to perform are:

1. Setting up a frame relay interface
2. Adding a PPP-FR pseudo interface
3. Configuring the PPP-FR pseudo interface to use a specific PVC on the frame relay interface

The rest of this section describes tasks 1 through 3. To configure a PPP-FR pseudo interface, use the PPP-FR configuration commands described in this chapter.

**Note:** You must restart the router for changes to the PPP-FR configuration commands to take effect.

## Adding a Frame Relay Interface

Follow the procedure described in Chapter 1 to add and configure a frame relay interface.

## Adding PPP-FR Pseudo Interfaces

PPP-FR pseudo interfaces are mapped to permanent virtual circuits over a frame relay interface. You can map multiple PPP-FR pseudo interfaces to one frame relay interface, but each has its own PVC. The DEC RouteAbout 90 supports a maximum of 8 PPP-FR pseudo interfaces, and the DEC RouteAbout 900 can support up to 32.

To add a PPP-FR pseudo device, use the **add device ppp-fr** command from the `Config>` process. The software assigns an interface number to each PPP-FR pseudo interface. You will use this number to configure the PPP-FR pseudo interface.

```
Example: Config>add device ppp-fr
Adding device as interface 3
```

## Configuring PPP-FR Pseudo Interface Parameters

You configure PPP-FR pseudo interfaces from the `PPP-FR Config>` process. To enter the `PPP-FR Config>` process, use the **network** command followed by the interface number of the PPP-FR pseudo interface. You can use the **list dev** command at the `Config>` prompt to display a list of the PPP-FR pseudo interfaces that you added.

```
Example: Config>network 3

PPP-FR configuration
PPP-FR Config>
```

Use the PPP-FR configuration commands described in the next section to configure the PPP-FR pseudo device.

## PPP-FR Configuration Commands

Table 10–1 summarizes the commands for configuring PPP-FR pseudo interfaces. The sections that follow explain these commands. Enter the commands at the `PPP-FR config>` prompt.

**Table 10–1 PPP–FR Configuration Command Summary**

| Command         | Function   |
|-----------------|--|
| <b>? (Help)</b> | Displays all the PPP–FR commands or lists the options for specific commands.   |
| <b>List</b>     | Lists all information related to the PPP-FR pseudo interfaces protocols, parameters and options.   |
| <b>Set</b>      | Sets Frame-Relay parameters, LCP options and parameters, IPCP options, BNCP options, PAP parameters, PAP IDs/passwords and NCP parameters. |
| <b>Delete</b>   | Deletes all information related to the PAP parameters, Ids and passwords.  |
| <b>Exit</b>     | Exits the PPP-FR configuration process and returns to the <code>Config&gt;</code> prompt.  |

### Help (?)

List the commands that are available from the current prompt level. You can also enter `?` after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
LIST
SET
DELETE
EXIT
```

Example: `list ?`

ALL  
LCP  
IPCP  
BNCP  
PARAMETERS  
PAP  
FRAME-RELAY

## List

Display information related to the PPP-FR pseudo interface and its protocol parameters and options.

**Syntax:** list        all  
                          bncp  
                          frame-relay  
                          ipcp  
                          lcp  
                          pap  
                          parameters

### all

Lists all options and parameters related to the PPP-FR pseudo interface.

Example: **list all**

```
LCP Parameters
-----
Config Request Tries:          20   Config Nak Tries:          10
Terminate Tries:              10   Retry Timer:              3000

LCP Options
-----
Max Receive Unit:             2048   Magic Number:            Yes
Password Authentication:      Yes

PAP Parameters
-----
Authent Request Tries:        20
Retry Timer:                  3000
Request Timer:                15000

PAP Ids/Passwords
```



```

-----
Local ID:                789
Local Password:          012

Remote ID:               xyz
Remote Password:         abc

NCP Parameters
-----
Config Request Tries:    20   Config Nak Tries:          10
Terminate Tries:        10   Retry Timer:              3000

IPCP Options
-----
IPCP Compression:                None
IP Address:      Don't Send or Request

PPP Over Frame Relay Parameters
-----
Frame Relay interface number:    2
Frame Relay PVC DLCI number:    100

```

**Note:** This example shows all possible options and parameters.

The following section explains the information displayed by the **list all** command.

#### *LCP Parameters*

|                             |  |
|-----------------------------|--|
| <i>Config Request Tries</i> | Number of times LCP sends <i>configure-request</i> packets to a peer station while attempting to open a PPP link.                    |
| <i>Terminate Tries</i>      | Number of times LCP sends <i>terminate-request</i> packets to a peer station to close a PPP link.                                    |
| <i>Config Nak Tries</i>     | Number of times LCP sends <i>configure-nak</i> (nak=not acknowledged) packets to a peer station while attempting to open a PPP link. |

#### *LCP Options*

|                         |   |
|-------------------------|---|
| <i>Max Receive Unit</i> | Maximum packet size that the link handles.  |
| <i>Magic Number</i>     | Indicates whether the “magic number” loopback detection option was enabled or disabled. |

*Password Authentication* Indicates whether the Password Authentication Protocol (PAP) option was enabled or disabled.

*PAP Parameters*

*Authent Request Tries* Number of times PAP sends *authentication-request* packets to a peer station while attempting to authenticate the remote station.

*Retry Timer* Amount of time, in milliseconds, that elapses before PAP attempts to authenticate the remote station again.

*Request Timer* Amount of time, in milliseconds, that elapses before PAP assumes that an authentication request is considered to have failed and PAP terminates the link.

*PAP Ids/  
Passwords*

*Local ID* A text string that specifies the identifier of the local station. PAP sends this string to the remote station to identify itself.

*Local Password* A text string that specifies the password of the local station. PAP sends this string to the remote station to authenticate its identifier.

*Remote ID* A text string that specifies the identifier of the remote station. When PAP receives an identifier string from the remote station, it compares the received string with this string. A mismatch results in authentication failure.

*Remote Password* A text string that specifies the password of the local station. When PAP receives a password string from the remote station, it compares the received string with this string. A mismatch results in authentication failure.

*NCP Parameters*

*Config Request Tries* Number of times NCP sends *configure-request* packets to a peer station while attempting to open a PPP link.

|  |  |
|--|--|
| <i>Terminate Tries</i>                 | Number of times NCP sends <i>terminate-request</i> packets to a peer station to close a PPP link.  |
| <i>Config Nak Tries</i>                | Number of times NCP sends <i>configure-nak</i> (nak=not acknowledged) packets to a peer station while attempting to open a PPP link.   |
| <i>Retry timer</i>                     | Amount of time, in milliseconds, that elapses before LCP's transmission of <i>configure-request</i> (to open the link) and <i>terminate-request</i> (to close the link) packets times out. Expiration of this timer causes a "timeout" and the halting of <i>configure-request</i> and <i>terminate-request</i> packet transmission. |
| <i>IPCP Options</i>                    |  |
| <i>IPCP Compression</i>                | Displays whether or not the PPP handler accepts compressed data. PPP supports Van Jacobson Compressed TCP/IP. Enable this option when the point-to-point link is running at a low baud rate.   |
| <i>IP Address</i>                      | Displays whether or not IPCP is configured to send the local IP address to the remote end of the link. Also displays whether or not IPCP is configured to request the IP address from the remote end of the link.  |
| <i>PPP Over Frame Relay Parameters</i> |  |
| <i>Frame Relay Interface Number</i>    | Indicates the interface number of the Frame Relay device that the PPP-FR device is using.  |
| <i>Frame Relay PVC DLCI Number</i>     | Indicates the circuit number of the Frame Relay PVC that the PPP-FR device is using.   |

## **bncp**

Lists the Bridging Network control protocol options.

Example: `list bncp`

```
BNCP Options
-----
Tinygram Compression: DISABLED
```

#### *BNCP Options*

*Tinygram Compression:* Indicates whether BNCP Tinygram compression is enabled or disabled.

### **ipcp**

Lists the Internet Protocol control protocol options. These fields are described under the **list all** command.

Example: **list ipcp**

```
IPCP Options
-----
IPCP Compression:           None
IP Address:                Don't Send or Request
```

### **lcp**

Lists parameters and options for the Link Control Protocol. These fields are described under the **list all** command.

Example: **list lcp**

```
LCP Parameters
-----
Config Request Tries:    20   Config Nak Tries:    10
Terminate Tries:        10   Retry Timer:         3000

LCP Options
-----
Max Receive Unit:       2048   Magic Number:        Yes
```

### **parameters**

Lists parameters for all Network Control Protocols. These parameters are described under the **list all** command.

Example: **list parameters**

```
NCP Parameters
-----
Config Request Tries:    20   Config Nak Tries:    10
Terminate Tries:        10   Retry Timer:         3000
```

## **pap**

Lists all parameters for the Password Authentication Protocol. These parameters are described under the **list all** command.

Example: **list pap**

```
PAP Parameters
-----
Authent Request Tries:           20
Retry Timer:                     3000
Request Timer:                   15000

PAP Ids/Passwords
-----
Local ID:                        789
Local Password:                  012

Remote ID:                       xyz
Remote Password:                 abc
```

## **frame-relay**

Lists parameters related to the frame relay interface and permanent virtual circuit which are associated with this PPP-FR pseudo interface. These fields are described under the **list all** command.

Example: **list frame-relay**

```
PPP Over Frame Relay Parameters
-----
Frame Relay interface number:    2
Frame Relay PVC DLCI number:    100
```

## **Set**

Set Frame Relay parameters, LCP options and parameters, IPCP options, BNCP options, and NCP parameters. Parameters affect only the interface that you are configuring. Options are active across the entire link.

You must use the **set frame-relay** command to establish the frame relay interface and PVC that the PPP-FR pseudo interface will use before you can make use of the PPP-FR circuit.

**Note:** Values immediately following the command option prompts reflect the current setting of that option. They are not always the default values.

**Syntax:** set        bncp  
                  frame-relay  
                  ipcp . . .  
                  lcp . . .  
                  pap ids/passwords  
                  pap parameters  
                  parameters . . .

### **bncp**

Sets Bridging Network Control Protocol (BNCP) parameters.

Example: **set bncp**

TINYGRAM COMPRESSION [no]:

|                                 |  |
|---------------------------------|--|
| <i>Tinygram<br/>Compression</i> | Specifies whether or not Tinygram Compression is used. This options is useful for some protocols, such as Local Area Terminal (LAT), that are prone to problems when bridged over low-speed (64 KBPS and below) lines. In these protocols, zeroes are added between the data and the frame checksum to pad the Protocol Data Unit (PDU) to the minimum size. Tinygram compression removes the zeroes and preserves the frame checksum at the transmitting end. At the receiving end, it restores the packet to the minimum length. |
|---------------------------------|--|

### **frame-relay**

This command is **mandatory**. It creates a Frame Relay PVC which it associates with the PPP-FR pseudo interface, and sets the Frame Relay options and parameters. You cannot make a PPP link over the PPP-FR pseudo interface until you have issued this command.

Example: **set frame-relay**

```
Frame Relay interface number? [0]? 2
Frame Relay PVC DLCI number? [0]? 333
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc) in bits [64000]?
Excess Burst Size (Be) in bits [0]?
```

|   |   |
|---|---|
| <i>Frame Relay interface number</i>     | Indicates the number of the Frame Relay Interface which the PPP-FR interface is to use.   |
| <i>Frame Relay PVC DLCI Number</i>      | <p>Indicates the circuit number in the range of 16 to 1007. This circuit number must not be already allocated. The PVC will be created and dedicated for use by the PPP-FR pseudo interface.</p> <p>The default value shows the current setting for this PPP-FR pseudo interface. It is initially set to 0, which is an illegal value, so you must define a valid circuit number.</p> |
| <i>Committed Information Rate (CIR)</i> | Indicates the committed information rate (CIR) in a range of 300 bps to 2048000 bps. The default is 64000 bps.  |
| <i>Committed Burst Size (Bc)</i>        | Indicates the number of the committed burst size (Bc) in a range of 300 bps to 2048000 bps. The default is 64000 bps.   |
| <i>Excess Burst Size (Be)</i>           | Indicates the number of the excess burst size (Be) in a range of 0 bps to 2048000 bps. The default is 0 bps.  |

## ipcp

Sets all Internet Protocol control protocol options for the link. Options are settings that are active across the entire link.

Example: **set ipcp**

```
IP COMPRESSION [no]:  
Send our IP address [no]:  
Request their IP address [no]:
```

*IPCP compression* Selects whether or not the PPP handler accepts compressed data. PPP supports Van Jacobson Compressed TCP/IP (RFC 1144). Enable this option when the point-to-point link is running at a low baud rate.

Setting this value to Yes enables compression. Setting this value to No disables compression. The default is No.

*Send our IP address* Specifies whether or not to send the local IP address to the remote end of the link. Set this option to Yes if the other end of the link requires the IP address. In either case, the PPP software sends the local IP address if the other end of the link requests it.

*Request their IP address* Specifies whether or not to request the IP address from the remote end of the link. If the PPP software receives the remote IP address, it displays the address with the PPP monitoring statistics.

## lcp options or parameters

Sets the Link Control Protocol options and parameters for the PPP link. Options are active across the entire link. Parameters affect only the specific interface.

Example: **set lcp options**

```
Maximum Receive Unit (bytes) [2048]?  
Magic Number [yes]:  
Password Authentication [no]:
```



|                                |   |
|--------------------------------|---|
| <i>Maximum receive unit</i>    | Sets the maximum packet size of the information field that can be transferred in a single datagram. The range is 576 to 4089 bytes. The default is 2048.  |
| <i>Magic number</i>            | <p>Specifies whether or not the magic number option is enabled. Magic number provides a way to detect looped-back links in serial line configurations. When this option is enabled, the link uses the system clock as a random number generator.</p> <p>When the LCP receives a Configure-Request with a magic number present (the magic number option is enabled), it compares the received magic number with the magic number in the last Configure-Request sent to the peer. If the two magic numbers are different, the link is not considered looped back. If the two magic numbers are the same, the PPP handler attempts to bring the link down and up again to renegotiate magic numbers.</p> <p>Setting this value to Yes enables the magic number option. Setting this value to No disables the option. The default is Yes.</p> |
| <i>Password Authentication</i> | <p>Specifies whether Password Authentication Protocol is enabled. The Password Authentication Protocol is used to provide additional security when establishing a point-to-point link. The remote system must be configured to match the identifier and password settings.</p> <p>If the PAP identifiers and passwords do not match at either end of the link then the connection will not be authorized.</p> <p>Setting this value to Yes enables Password Authentication Protocol. Setting this value to No disables the option. The default is No.</p>   |

**Example: set lcp parameters**

```

Config tries [20]?
NAK tries [10]?
Terminate tries [10]?
Retry timer (mSec) [3000]?

```

|                        |  |
|------------------------|--|
| <i>Config tries</i>    | <p>Sets the number of configure-request packets that LCP sends to a peer station to attempt to open a PPP link. The range is 1 to 100. The default is 20.</p> <p>The retry timer starts after the first configure-request packet is transmitted. This is done to guard against packet loss.</p>  |
| <i>NAK tries</i>       | <p>Sets the number of configure-nak (nak = not acknowledged) packets that LCP sends to a peer station while attempting open a PPP link. The range is 1 to 100. The default is 10.</p> <p>Upon receiving configure-request packets with unacceptable configuration options, LCP sends configure-nak packets. These packets are sent to refuse the offered configuration options and to suggest modified, acceptable values.</p> |
| <i>Terminate tries</i> | <p>Sets the number terminate-request packets that LCP sends to a peer station to close a PPP link. The range is 1 to 100. The default is 10.</p> <p>The retry timer starts after the first terminate-request packet is transmitted. This is done to guard against packet loss.</p>   |
| <i>Retry timer</i>     | <p>Sets the amount of time, in milliseconds, that elapses before LCP's transmission of configure-request (to open the link) and terminate-request (to close the link) packets is timed out. Expiration of this timer causes a timeout and the halting of configure-request and terminate-request packet transmission. The range is 200 to 30000 milliseconds. The default is 3000 milliseconds.</p>                            |

## **pap ids/passwords**

Sets the Password Authentication Protocol local and remote IDs/passwords. IDs and passwords affect only the specific interface.

Example: **set pap local**

```
Local ID []:  
Local Password []:
```

*Local ID* A text string that specifies the identifier of the local station. PAP sends this string to the remote station to identify itself. The string can contain any combination of up to 255 alphanumeric characters.

*Local Password* A text string that specifies the password of the local station. PAP sends this string to the remote station to authenticate its identifier. The string can be any combination of up to 255 alphanumeric characters.

Example: **set pap remote**

```
Remote ID []:  
Remote Password []:
```

*Remote ID* A text string that specifies the identifier of the remote station. When PAP receives an identifier string from the remote station, it compares the received string with this string. A mismatch results in authentication failure. The string can contain any combination of up to 255 alphanumeric characters.

*Remote Password* A text string that specifies the password of the remote station. When PAP receives a password string from the remote station, it compares the received string with this string. A mismatch results in authentication failure. The string can contain any combination of up to 255 alphanumeric characters.

## **pap parameters**

Sets the Password Authentication Protocol parameters. These parameters affect only the specific interface for which you are setting them.

Example: **set pap parameters**

```
Request tries [20]?
Retry timer (mSec) [3000]?
Request timer (mSec) [15000]?
```

*Request tries* Sets the number of authentication-request packets PAP sends to a peer station to attempt to authenticate the remote station. The range is 1 to 100. The default is 20.

*Retry timer* Sets the amount of time, in milliseconds, that elapses before PAP attempts to authenticate the remote station again. The range is 200 to 30000 milliseconds. The default is 3000 milliseconds.

*Request timer* Sets the amount of time, in milliseconds, that elapses before PAP assumes an authentication request is considered to have failed and PAP terminates the link. The range is 200 to 150000 milliseconds. The default is 15000 milliseconds.

## **parameters**

Sets parameters for all Network Control Protocols.

Example: **set parameters**

```
Config tries [20]?
NAK tries [10]?
Terminate tries [10]?
Retry timer (mSec) [3000]?
```

|                        |   |
|------------------------|---|
| <i>Config tries</i>    | <p>Sets the number of configure-request packets that NCP sends to a peer station to attempt to open a PPP link. The range is 1 to 100. The default is 20.</p> <p>This action indicates the desire to open an LCP connection with a specified set of configuration options. The retry timer starts after a configure-request packet is transmitted. This is done to guard against packet loss.</p>   |
| <i>NAK tries</i>       | <p>Sets the number of configure-nak (nak = not acknowledged) packets that NCP sends to a peer station while attempting open a PPP link. The range is 1 to 100. The default value is 10.</p> <p>Upon receiving configure-request packets with some unacceptable configuration options, NCP sends configure-nak packets. These packets are sent to refuse the offered configuration options and to suggest modified, acceptable values.</p> |
| <i>Terminate tries</i> | <p>Sets the number of terminate-request packets that NCP sends to a peer station to close a PPP link. The range is 1 to 100. The default value is 10.</p> <p>This action indicates the desire to close an NCP connection. The retry timer is started after a terminate-request packet is transmitted. This is done to guard against packet loss.</p>  |
| <i>Retry timer</i>     | <p>Sets the amount of time, in milliseconds, that elapses before NCP's transmission of configure-request (to open the link) and terminate-request (to close the link) packets is timed out. Expiration of this timer causes a timeout and the halting of configure-request and terminate-request packet transmission. The range is 200 to 30000 milliseconds. The default is 3000 milliseconds.</p>                                       |

## Delete

Delete local and remote PAP identifiers and passwords. Delete affects only the interface that you are configuring.

**Syntax:** delete    \_  
                          local  
                          remote  
                          \_

### local

Deletes local PAP identifiers and passwords.

Example: **delete local**

```
Delete Local ID/Password 789/012? [Yes]:
```

*Delete Local  
ID/Password*

Specifies whether or not the local identifier and password are to be cleared. The command displays the current settings of both parameters.

Setting this value to Yes deletes the local identifier and password. Setting this value to No leaves the current values as they are. The default is Yes.

### remote

Deletes remote PAP identifiers and passwords.

Example: **delete remote**

```
Delete Remote ID/Password xyz/abc? [Yes]:
```

*Delete Remote  
ID/Password*

Specifies whether or not the remote identifier and password are to be cleared. The command displays the current settings of both parameters.

Setting this value to Yes deletes the remote identifier and password. Setting this value to No leaves the current values as they are. The default is Yes.

## Exit

Return to the Config> prompt.

**Syntax:**    \_  
                  exit

Example: **exit**

---

## Monitoring Point-to-Point Protocol over Frame Relay Pseudo Interfaces

This chapter describes how to monitor specific Point-to-Point Protocol over Frame Relay (PPP-FR) pseudo interfaces in the router.

For more information on Point-to-Point Protocol and Frame Relay interfaces and configurations, refer to the *Routing Protocols Reference Guide*.

### Accessing the Interface Console Process

Follow the procedure described in Chapter 1 to access the interface console process for the interface described in this chapter. After you access the desired interface console process, you may begin entering console commands.

### PPP-FR Console Commands

This section explains the PPP-FR console commands. Enter the commands at the PPP-FR> prompt.

**Table 11–1 PPP-FR Console Command Summary**

| Command  | Function   |
|----------|--|
| ? (Help) | Displays all the PPP-FR commands or lists subcommand options for specific commands (if available).       |
| Clear    | Clears all statistics from PPP-FR pseudo interfaces.   |
| List     | Displays information and counters related to the PPP-FR pseudo interface and PPP parameters and options. |
| Exit     | Exits the PPP-FR console process.  |

## ? (Help)

List the available commands. You can also enter ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
CLEAR
LIST
EXIT
```

Example: **list** ?

```
ALL
CONTROL
ERRORS
IP
DN
IPX
AP2
OSI
IPCP
DNCP
IPXCP
BNCP
ATCP
OSICP
LCP
FRAME-RELAY
```

## Clear

Clear all statistics from PPP-FR pseudo interfaces.

**Syntax:** clear

Example: **clear**



## List

Display information and counters related to the PPP-FR pseudo interface and PPP parameters and options. The **list all** command displays all information related to the PPP-FR interface. You can display specific groups of information by listing the information for that group only.

**Syntax:**    list        all  
                  ap2  
                  atcp  
                  bncp  
                  control . . .  
                  dn  
                  dncp  
                  errors  
                  frame-relay  
                  ip  
                  ipcp  
                  ipx  
                  ipxcp  
                  lcp  
                  osi  
                  osicp  
                  pap

### all

Lists all information and counters related to the PPP-FR pseudo interface and PPP options and parameters. While the output displayed is shown following the command example below, specific fields that are defined under the **list** command that displays that specific statistical group. For example, Error Type fields are explained under the **list error** command.

Example: list all

```
Version: 1
LCP State: Req Sent
Previous State: Listen
Time Since Change: 18 seconds

LCP Option Local Remote
-----
Max Receive Unit: 2048 1500
Async Char Mask: FFFFFFFF FFFFFFFF
Authentication: None None
Magic Number: 8F202AE1 None
Protocol Compr: No No
Addr/Cntl Compr: No No
32-Bit Checksum: No No

PAP State: Closed
Previous State: Closed
Time Since Change: 53 minutes and 30 seconds

PAP Ids/Passwords
-----
Local ID: FOO
Local Password: BAR

Remote ID: FOO
Remote Password: BAR

IPCP State: Open
Previous State: Ack Sent
Time Since Change: 2 hours, 15 minutes and 53 seconds

IPCP Option Local Remote
-----
IP Address 128.189.209.20 None
Compression Slots None None

DNCP State: Closed
Previous State: Closed
Time Since Change: 5 hours, 15 minutes and 55 seconds

IPXCP State: Open
Previous State: Request Sent
Time Since Change: 3 hours, 15 minutes and 55 seconds
BNCP State: Closed
Previous State: Closed
Time Since Change: 5 hours, 15 minutes and 56 seconds

BNCP Option Local Remote
-----
Tinygram Compression DISABLED DISABLED
```

Source-route Info:  
Remote side does not support source-route bridging

ATCP State: Open  
Previous State: Request Sent  
Time Since Change: 5 hours, 15 minutes and 57 seconds  
AppleTalk Address Info:  
Common network number = 12  
Local node ID = 49  
Remote node ID = 86

OSICP State: Closed  
Previous State: Closed  
Time Since Change: 5 hours, 15 minutes and 58 seconds

| LCP Statistic | In   | Out   |
|---------------|------|-------|
| -----         | --   | ---   |
| Packets:      | 226  | 2880  |
| Octets:       | 6780 | 40320 |
| Cfg Req:      | 0    | 2880  |
| Cfg Ack:      | 0    | 0     |
| Cfg Nak:      | 0    | 0     |
| Cfg Rej:      | 0    | 0     |
| Term Req:     | 0    | 0     |
| Term Ack:     | 0    | 0     |
| Echo Req:     | 113  | 113   |
| Echo Resp:    | 113  | 113   |
| Disc Req:     | 0    | 0     |
| Code Rej:     | 0    | 0     |

| PAP Statistic | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Auth Req:     | 0  | 0   |
| Auth Ack:     | 0  | 0   |
| Auth Nak:     | 0  | 0   |

| IPCP Statistic | In  | Out |
|----------------|-----|-----|
| -----          | --  | --- |
| Packets:       | 5   | 0   |
| Octets:        | 100 | 170 |
| Prot Rejects:  | 0   | -   |

| IP Statistic  | In    | Out   |
|---------------|-------|-------|
| -----         | --    | ---   |
| Packets:      | 3456  | 3456  |
| Octets:       | 27648 | 27648 |
| Prot Rejects: | 0     | -     |

| DNCP Statistic | In | Out |
|----------------|----|-----|
| -----          | -- | --- |
| Packets:       | 0  | 0   |

|                 |        |          |
|-----------------|--------|----------|
| Octets:         | 0      | 0        |
| Prot Rejects:   | 0      | -        |
| DN Statistic    | In     | Out      |
| -----           | --     | ---      |
| Packets:        | 0      | 0        |
| Octets:         | 0      | 0        |
| Prot Rejects:   | 0      | -        |
| IPXCP Statistic | In     | Out      |
| -----           | --     | ---      |
| Packets:        | 0      | 0        |
| Octets:         | 0      | 0        |
| Prot Rejects:   | 0      | -        |
| IPX Statistic   | In     | Out      |
| -----           | --     | ---      |
| Packets:        | 0      | 0        |
| Octets:         | 0      | 0        |
| Prot Rejects:   | 0      | -        |
| BNCP Statistic  | In     | Out      |
| -----           | --     | ---      |
| Packets:        | 0      | 0        |
| Octets:         | 0      | 0        |
| Prot Rejects:   | 0      | -        |
| ATCP Statistic  | In     | Out      |
| -----           | --     | ---      |
| Packets:        | 349    | 351      |
| Octets:         | 128488 | 129412   |
| Prot Rejects:   | 0      | -        |
| AP2 Statistic   | In     | Out      |
| -----           | --     | ---      |
| Packets:        | 349    | 351      |
| Octets:         | 128488 | 129412   |
| Prot Rejects:   | 0      | -        |
| OSICP Statistic | In     | Out      |
| -----           | --     | ---      |
| Packets:        | 0      | 0        |
| Octets:         | 0      | 0        |
| Prot Rejects:   | 0      | -        |
| OSI Statistic   | In     | Out      |
| -----           | --     | ---      |
| Packets:        | 0      | 0        |
| Octets:         | 0      | 0        |
| Prot Rejects:   | 0      | -        |
| Error Type      | Count  | Last One |
| -----           | -----  | -----    |
| Bad Address:    | 0      | 0        |

```

Bad Control:          0          0
Unknown Protocol:    0          0
Invalid Protocol:    0          0
Config Timeouts:    145         -
Terminate Timeouts:  0

```

Frame Relay PVC Statistics

-----

Frame Relay Interface Number: 2

| Circuit# | Circuit Name | State  | Frames Transmitted | Frames Received |
|----------|--------------|--------|--------------------|-----------------|
| 100      | PPP Circuit  | Active | 2380503            | 71717           |

### ap2

Lists AppleTalk Phase 2 statistics for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list ap2**

```

AP2 Statistic      In      Out
-----
Packets:           349     351
Octets:            128488  129412
Prot Rejects:      0

```

### atcp

Lists statistics for the AppleTalk control protocol. These fields are the same as those described under the **list ip** command.

Example: **list atcp**

```

ATCP Statistic      In      Out
-----
Packets:             0        0
Octets:              0        0
Prot Rejects:        0        -

```

### bncp

Lists statistics for the Bridging Network control protocol. These fields are the same as those described under the **list ip** command.

Example: **list bncp**

| BNCP Statistic | In | Out |
|----------------|----|-----|
| -----          | -- | --- |
| Packets:       | 0  | 0   |
| Octets:        | 0  | 0   |
| Prot Rejects:  | 0  | -   |

**control**

- lcp**
- pap**
- ipcp**
- dncp**
- ipxcp**
- bncp**
- atcp**
- osicp**

Lists information and counters related to the specified control protocol.

Example: **list control lcp**

```
LCP State:          Listen
Previous State:    Req Sent
Time Since Change: 8 seconds
```

| LCP Option        | Local    | Remote   |
|-------------------|----------|----------|
| -----             | -----    | -----    |
| Max Receive Unit: | 2048     | 1500     |
| Async Char Mask:  | FFFFFFFF | FFFFFFFF |
| Authentication:   | None     | None     |
| Magic Number:     | B87DA37F | None     |
| Protocol Compr:   | No       | No       |
| Addr/Cntl Compr:  | o        | No       |
| 32-Bit Checksum:  | No       | No       |

*LCP State*

Displays the current state of the point-to-point link. These states include the following:

- **Open** – Indicates that a connection was made and data can be sent. The retry timer does not run in this state.
- **Closed** – Indicates that the link is down and there is no attempt being made to open it. In this state, all connection requests from peers are rejected.
- **Listen** – Indicates that the link is down and there is no attempt being made to open it. In contrast to the CLOSED state, all connection requests from peers are accepted.
- **Request-Sent** – Indicates that an active attempt is being made to open the link. A Configure-request packet was sent but a Configure-Ack was not yet received nor was one sent. The retry timer is running at this time.
- **Ack-Received** – Indicates that a Configure-request packet was sent and a Configure-Ack packet was received. The retry timer is still running since a Configure-Ack packet was not transmitted.
- **Ack-Sent** – Indicates that a Configure-Ack packet and a Configure-request packet were sent but a Configure-Ack packet was not received. The retry timer always runs in this state.
- **Closing** – Indicates that an attempt is being made to close the connection. A Terminate-request packet was sent but a Terminate-Ack packet was not received. The retry timer is running in this state.

*Previous State*

Displays the state of the point-to-point link prior to the state displayed in the LCP State field. These states are the same as those described in the LCP State field.

*Time Since Change* Displays the amount of time the link is in the present state.

*LCP Option*

*Max receive unit* Displays the maximum packet size set for both the local and remote end of the link.

*Asyn character mask* Not currently supported. PPP accepts this option but ignore it.

*Authentication* Not currently supported. PPP rejects this option if it is received.

*Magic number* The current magic number for both the local and remote end of the link.

*Protocol compression* Not currently supported. PPP rejects this option if it is received.

*Address/Control compression* Not currently supported. PPP rejects this option if it is received.

*32-bit checksum* Not currently supported. PPP rejects this option if it is received.

**Example: list control pap**

```
PAP State:          Closed
Previous State:     Closed
Time Since Change:  53 minutes and 30 seconds

PAP Ids/Passwords
-----
Local ID:           FOO
Local Password:     BAR

Remote ID:          FOO
Remote Password:    BAR
```



|                              |   |
|------------------------------|---|
| <i>PAP State</i>             | <p>Displays the current state of the authentications protocol. These states include the following:</p> <ul style="list-style-type: none"> <li>• <b>Closed</b> – Indicates that the link is down and there is no attempt being made to open it. This state indicates that authentication is not in progress.</li> <li>• <b>Closing</b> – Indicates that authentication has failed and the link is in the termination process.</li> <li>• <b>Listen</b> – Indicates that the local station is waiting for an authentication request from the remote station.</li> <li>• <b>Req Sent</b> – The local station has sent the authentication request containing the local ID and password. The remote station has not responded.</li> <li>• <b>Ack Rcvd</b> – The local station has received positive acknowledgement for its ID and password.</li> <li>• <b>Ack Sent</b> – The local station has received the remote station's ID and password and has sent acknowledgement.</li> <li>• <b>Opened</b> – Authentication is complete and link establishment is proceeding.</li> </ul> |
| <i>Previous State</i>        | <p>Displays the state of the pap protocol prior to the state displayed in the PAP State field. These states are the same as those described in <i>PAP State</i> above.</p>  |
| <i>Time Since Change</i>     | <p>Displays the amount of time the link is in the present state.</p>  |
| <i>PAP<br/>Ids/Passwords</i> |   |
| <i>Local ID</i>              | <p>The identifier string sent by the local station in an authentication request packet.</p>   |

|                        |  |
|------------------------|--|
| <i>Local Password</i>  | The password string sent by the local station in an authentication request packet.                     |
| <i>Remote ID</i>       | The identifier string expected by the local station when an authentication request packet is received. |
| <i>Remote Password</i> | The password string expected by the local station when an authentication request packet is received.   |

Example: **list control ipcp**

```

IPCP State:          Listen
Previous State:      Closed
Time Since Change:   20 seconds

IPCP Option          Local          Remote
-----
IP Address            128.189.209.20   None
Compression Slots    None              None

```

The IPCP State fields are the same as those described under the **list control lcp** command.

*IPCP Option*

|                          |   |
|--------------------------|---|
| <i>IPCP Address</i>      | The IP address of the local and remote ends of the link, if available.                          |
| <i>Compression Slots</i> | The number IP headers saved for reference to determine the type of compression that is enabled. |

Example: **list control dnpcp**

```

DNCP State:          Closed
Previous State:      Closed
Time Since Change:   6 hours, 23 minutes and 37 seconds

```

The DNCP State fields are the same as those described under the **list control lcp** command.

Example: **list control ipxcp**

```

IPXCP State:         Closed
Previous State:      Closed
Time Since Change:   2 hours, 9 minutes and 2 seconds

```

The IPXCP State fields are the same as those described under the **list control lcp** command.

Example: **list control bncp**

```
BNCP State:          Closed
Previous State:      Closed
Time Since Change:   5 hours, 25 minutes and 3 seconds

BNCP Option          Local          Remote
-----
Tinygram Compression  DISABLED          DISABLED

Source-route Info:
Remote side does not support source-route bridging
```

The BNCP State fields are the same as those described under the **list control lcp** command.

#### *BNCP Option*

|                             |  |
|-----------------------------|--|
| <i>Tinygram Compression</i> | Displays whether or not Tinygram Compression is enabled or disabled on the local and remote ends of the link.              |
| <i>Source-route Info</i>    | Displays whether or not source route bridging is enabled for the local and remote ports that correspond to this interface. |

Example: **list control atcp**

```
ATCP State:          Closed
Previous State:      Closed
Time Since Change:   6 hours, 27 minutes and 7 seconds
AppleTalk Address Info:
Common network number = 12
Local node ID = 49
Remote node ID = 76
```

The ATCP State fields are the same as those described under the **list control lcp** command.

*AppleTalk  
Address Info*

- Common Network Number* Displays the network number of the two ends of the point-to-point link. (You must statically configure both ends of the link to have the same network number.)
- Local Node ID* Displays the unique node number of the local end of the link.
- Remote Node ID* Displays the unique node number of the remote end of the link.

Example: **list control osicp**

```
OSICP State:      Closed
Previous State:   Closed
Time Since Change: 6 hours, 28 minutes and 32 seconds
```

The OSICP State fields are the same as those described under the **list control lcp** command.

**dn**

Lists statistics related to DECnet packets for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list dn**

```
DN Statistic      In      Out
-----
Packets:          0        0
Octets:           0        0
Prot Rejects:     0        -
```

**dncp**

Lists statistics for the DECnet control protocol. These fields are the same as those described under the **list ip** command.

Example: `list dnmp`

| DNMP Statistic | In | Out |
|----------------|----|-----|
| -----          | -- | --- |
| Packets:       | 0  | 0   |
| Octets:        | 0  | 0   |
| Prot Rejects:  | 0  | -   |

## errors

Lists information related to all error conditions tracked by the PPP software.

Example: `list error`

| Error Type          | Count | Last One |
|---------------------|-------|----------|
| -----               | ----- | -----    |
| Bad Address:        | 0     | 0        |
| Bad Control:        | 0     | 0        |
| Unknown Protocol:   | 0     | 0        |
| Invalid Protocol:   | 0     | 0        |
| Config Timeouts:    | 0     | 0        |
| Terminate Timeouts: | 0     | 0        |

### *Error Type*

|                           |  |
|---------------------------|--|
| <i>Bad address</i>        | Displays the total number of bad addresses encountered over the point-to-point link.       |
| <i>Bad control</i>        | Displays the total number of bad control packets encountered over the point-to-point link. |
| <i>Unknown protocol</i>   | Displays the total number of unknown protocol packets encountered by the current link.     |
| <i>Invalid protocol</i>   | Displays the total number of invalid protocol packets encountered by the current link.     |
| <i>Config timeouts</i>    | Displays the total number configuration timeouts experienced by the link.                  |
| <i>Terminate timeouts</i> | Displays the total number of link termination timeouts experienced by the link.            |

## frame-relay

Lists status information for the frame relay PVC associated with the PPP-FR pseudo interface.

Example: **list frame-relay**

```
Frame Relay PVC Statistics
-----

Frame Relay Interface Number: 2

Circuit#      Circuit Name      State      Frames      Frames
-----      -
           100      PPP Circuit      Active      2380503      71717
```

|                                     |   |
|-------------------------------------|---|
| <i>Frame Relay Interface Number</i> | Indicates the network number of the frame relay interface.  |
| <i>Circuit Number</i>               | Indicates the DLCI number of the configured PVC at the local frame relay interface.   |
| <i>Circuit Name</i>                 | Indicates the ASCII designation of the configured PVC at the local frame relay interface. This name is set to <i>PPP Circuit</i> for all PPP-FR circuits. |
| <i>State</i>                        | Indicates the current state of the circuits ( <i>Active</i> , <i>Inactive</i> or <i>Congested</i> ).  |
| <i>Frames Transmitted</i>           | Indicates the total number of frames transmitted over the current PPP-FR pseudo interface.  |
| <i>Frames Received</i>              | Indicates the total number of frames received over the current PPP-FR pseudo interface.   |

## ip

Lists all information related to IP packets over the point-to-point link.

Example: **list ip**

```
Ip Statistic      In      Out
-----
Packets:          349     351
Octets:           128488  129412
Prot Rejects:     0
```

### *Ip Statistic*

|                     |   |
|---------------------|---|
| <i>Packets</i>      | Displays the total number of IP packets transmitted (out) and received (in) over the current point-to-point interface.        |
| <i>Octets</i>       | Displays the total number of bytes of IP data, in octets, transmitted and received over the current point-to-point interface. |
| <i>Prot Rejects</i> | Displays the total number of protocol-reject packets transmitted and received over the current point-to-point interface.      |

### **ipcp**

Lists IPCP statistics for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list ipcp**

| <i>Ipcp Statistic</i> | <i>In</i> | <i>Out</i> |
|-----------------------|-----------|------------|
| -----                 | --        | ---        |
| Packets:              | 0         | 0          |
| Octets:               | 0         | 0          |
| Prot Rejects:         | 0         |            |

### **ipx**

Lists IPX statistics for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list ipx**

| <i>IPX Statistic</i> | <i>In</i> | <i>Out</i> |
|----------------------|-----------|------------|
| -----                | --        | ---        |
| Packets:             | 0         | 0          |
| Octets:              | 0         | 0          |
| Prot Rejects:        | 0         | -          |

### **ipxcp**

Lists statistics for the IPX control protocol. These fields are the same as those described under the **list ip** command.

Example: **list ipxcp**

| IPXCP Statistic | In | Out |
|-----------------|----|-----|
| -----           | -- | --- |
| Packets:        | 0  | 0   |
| Octets:         | 0  | 0   |
| Prot Rejects:   | 0  | -   |

## lcp

Lists statistics for the Link Control Protocol.

Example: `list lcp`

| LCP Statistic | In | Out   |
|---------------|----|-------|
| -----         | -- | ---   |
| Packets:      | 0  | 3833  |
| Octets:       | 0  | 53662 |
| Cfg Req:      | 0  | 3833  |
| Cfg Ack:      | 0  | 0     |
| Cfg Nak:      | 0  | 0     |
| Cfg Rej:      | 0  | 0     |
| Term Req:     | 0  | 0     |
| Term Ack:     | 0  | 0     |
| Echo Req:     | 0  | 0     |
| Echo Resp:    | 0  | 0     |
| Disc Req:     | 0  | 0     |
| Code Rej:     | 0  | 0     |

### *LCP Statistic*

|                |   |
|----------------|---|
| <i>Packets</i> | Displays the total number of packets transmitted (out) and received (in) over the current point-to-point interface.                       |
| <i>Octets</i>  | Displays the total number of bytes in octets transmitted and received over the current point-to-point interface.                          |
| <i>Cfg Req</i> | Displays the total number of configure-request packets transmitted and received over the current point-to-point interface.                |
| <i>Cfg Ack</i> | Displays the total number of configure-ack (acknowledged) packets transmitted and received over the current point-to-point interface.     |
| <i>Cfg Nak</i> | Displays the total number of configure-nak (not acknowledged) packets transmitted and received over the current point-to-point interface. |



|                 |  |
|-----------------|--|
| <i>Cfg Rej</i>  | Displays the total number of configure-reject packets transmitted and received over the current point-to-point interface.            |
| <i>Term Req</i> | Displays the total number of terminal-request packets transmitted and received over the current point-to-point interface.            |
| <i>Term Ack</i> | Displays the total number of terminal-ack (acknowledged) packets transmitted and received over the current point-to-point interface. |
| <i>Echo Req</i> | Displays the total number of echo-request packets transmitted and received over the current point-to-point interface.                |
| <i>Disc Req</i> | Displays the total number of discard-request packets transmitted and received over the current point-to-point interface.             |
| <i>Code Rej</i> | Displays the total number of code-reject packets transmitted and received over the current point-to-point interface.                 |

## **osi**

Lists OSI statistics for the point-to-point interface. These fields are the same as those described under the **list ip** command.

Example: **list osi**

| OSI Statistic | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Prot Rejects: | 0  | -   |

## **osicp**

Lists statistics for the OSI control protocol. These fields are the same as those described under the **list ip** command.

Example: **list osicp**

| OSICP Statistic | In | Out |
|-----------------|----|-----|
| -----           | -- | --- |
| Packets:        | 0  | 0   |
| Octets:         | 0  | 0   |
| Prot Rejects:   | 0  | -   |

## **pap**

Lists statistics for the Password Authentication Protocol.

Example: **list pap**

| PAP Statistic | In | Out |
|---------------|----|-----|
| -----         | -- | --- |
| Packets:      | 0  | 0   |
| Octets:       | 0  | 0   |
| Auth Req:     | 0  | 0   |
| Auth Ack:     | 0  | 0   |
| Auth Nak:     | 0  | 0   |

- Packets* Displays the total number of PAP packets transmitted (out) and received (in) over the current point-to-point interface.
- Octets* Displays the total number of bytes of PAP data, in octets, transmitted and received over the current point-to-point interface.
- Auth Req* Displays the total number of authentication packets transmitted and received over the current point-to-point interface.
- Auth Ack* Displays the total number of acknowledgement packets transmitted and received over the current point-to-point interface.
- Auth Nak* Displays the total number of negative acknowledgement packets transmitted and received over the current point-to-point interface.

## **Exit**

Return to the CGWCON prompt (+).

**Syntax:** exit

Example: **exit**

## PPP-FR Pseudo Interfaces and the GWCON Interface Command

While PPP-FR pseudo interfaces have their own console processes for monitoring purposes, bridging routers also display complete statistics for installed network interfaces when you use the **interface** command from the GWCON environment.

Example: **interface 3**

```

Nt Nt' Interface      CSR  Vec      Self-Test Self-Test  Maintenance
3  3  PPP/1             0    0        Passed   Failed   Failed
                                1        0         0         0
Point to Point MAC/data-link on PPP-FR Pseudo Device interface

Frame Relay PVC Statistics
-----

Frame Relay Interface Number: 2

Circuit#      Circuit Name      State      Frames      Frames
-----      -
100          PPP Circuit      Active     3133       89

```

The following table describes the output.

|                                     |   |
|-------------------------------------|---|
| <i>Nt</i>                           | Indicates the serial line interface number.   |
| <i>Nt'</i>                          | Indicates the serial line interface number.   |
| <i>Interface</i>                    | Indicates the interface type and its instance number.                               |
| <i>CSR</i>                          | Not applicable to a PPP-FR pseudo device.   |
| <i>Vec</i>                          | Not applicable to a PPP-FR pseudo device.   |
| <i>Self-Test Passed</i>             | Indicates the number of self-tests that succeeded.                                  |
| <i>Self-Test Failed</i>             | Indicates the number of self-tests that failed.                                     |
| <i>Frame Relay Interface Number</i> | Indicates the network number of the frame relay interface.                          |
| <i>Circuit Number</i>               | Indicates the DLCI number of the configured PVC at the local frame relay interface. |

|                           |   |
|---------------------------|---|
| <i>Circuit Name</i>       | Indicates the ASCII designation of the configured PVC at the local frame relay interface. This name is set to <i>PPP Circuit</i> for all PPP-FR circuits. |
| <i>State</i>              | Indicates the current state of the circuits ( <i>Active</i> , <i>Inactive</i> or <i>Congested</i> ).  |
| <i>Frames Transmitted</i> | Indicates the total number of frames transmitted over the current PPP-FR pseudo interface.  |
| <i>Frames Received</i>    | Indicates the total number of frames received over the current PPP-FR pseudo interface.   |

---

## Configuring the V.25 *bis* Network Interface

The V.25*bis* interface allows Digital routers to establish serial connections over switched telephone lines using V.25*bis* modems. This chapter describes how to configure a V.25*bis* interface.

For more information about V.25*bis*, see the *Routing Protocols Reference Guide*.

### Accessing the Interface Configuration Process

For information about accessing the V.25*bis* configuration environment, refer to Chapter 1.

### Configuration Procedures

This section describes how to configure your router for V.25 *bis*. Specifically, the tasks you need to perform are:

1. Setting up a serial line interface
2. Adding a network address name and network address
3. Adding dial circuits
4. Configuring dial circuit parameters
5. Configuring V.25 *bis* interface parameters

The rest of this section describes tasks 1 through 4. To configure V.25 *bis*, use the V.25 *bis* configuration commands described in this chapter.

**Note:** You must restart the router for changes to the V.25 *bis* configuration commands to take effect.

## Adding a Network Address Name and Network Address

You need to add a network address name and a network dial address name for each local port (serial line interface) as well as for each destination port. The network dial address is the telephone number of the local or destination port. The network address name can be anything, such as a description of the port.

To add a network address and network address name:

1. At the `Config>` prompt type the **add v25-bis-address** command, and then press **RETURN**.
2. When prompted, type the address name of the port, and then press **RETURN**. You can use any string of up to 23 printable ASCII characters.
3. When prompted, type the network dial address of the port, and then press **RETURN**. You can enter up to 32 characters that are in the valid format of the connected V.25 *bis* modem.

Example: `Config>add v25-bis-address`

```
Assign address name [1-23] chars []? remote-site-baltimore
Assign network dial address [1-20 digits] []? 1-909-555-0983
```

## Adding Dial Circuits

Dial circuits are mapped to V.25 *bis* serial line interfaces. You can map multiple dial circuits to one serial line interface.

To add a dial circuit, use the **add device dial-circuit** command from the `Config>` process. The software assigns an interface number to each circuit. You will use this number to configure the dial circuit.

Example: `Config>add device dial-circuit`  
Adding device as interface 6

**Note:** Dial circuits default to the PPP protocol. You can change the protocol to the Proteon Serial Link (PSL) protocol using the **set data-link psl** command at the `Config>` prompt. Other data-link types (Frame Relay, X.25, V.25 *bis*, SDLC, and SRLY) are not supported at this time.

## Configuring Dial Circuit Parameters

You configure dial circuits from the `Circuit Config>` process. To enter the `Circuit Config>` process, use the **network** command followed by the interface number of the dial circuit. You can use the **list dev** command at the `Config>` prompt to display a list of the dial circuits that you added.

Example: `Config>network 6`

```
Circuit configuration
Circuit Config>
```

Use the dial circuit configuration commands described in the next section to configure the dial circuit.

## Dial Circuit Configuration Commands

This section summarizes and explains the dial circuit configuration commands. These commands allow you to display, create, or modify a dial circuit configuration. Enter the dial circuit configuration commands at the `Circuit Config>` prompt.

Table 12–1 lists the dial circuit configuration commands.

**Table 12–1 Dial Circuit Configuration Commands Summary**

| Command             | Function  |
|---------------------|---|
| <b>? (Help)</b>     | Lists the configuration commands or lists the options associated with that command.   |
| <b>Delete</b>       | Deletes the inbound call settings from the dial circuit configuration.  |
| <b>Encapsulator</b> | Allows you to change the data-link protocol configuration.  |
| <b>List</b>         | Displays the dial circuit configuration parameters.   |
| <b>Set</b>          | Configures the dial circuit for inbound or outbound calls, maps the dial circuit to a serial line interface, and sets addresses, idle timeout, and self-test delay. |
| <b>Exit</b>         | Exits the dial circuit configuration process and returns to the <code>Config&gt;</code> prompt.   |

## ? (Help)

List the available commands. You can also enter ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
DELETE
ENCAPSULATOR
LIST
SET
EXIT
```

Example: **Set** ?

```
NET
CALLS
DESTINATION
INBOUND DESTINATION
ANY_INBOUND
IDLE
SELFTTEST-DELAY
```

## Delete

Remove the inbound call settings from the dial circuit configuration.

**Syntax:** delete inbound destination

### **delete inbound destination**

Removes both the inbound destination and the any\_inbound settings from the dial circuit configuration. This causes the dial circuit to accept calls only from callers that have a phone number that matches the destination parameter.

Example: **delete inbound**

## Encapsulator

Enter the configuration process for the link-layer protocol that is running on the dial circuit. The default protocol for dial circuits is PPP (SLC Config> prompt). You can change the protocol to PSL using the **set data-link** command at the Config> prompt.

**Syntax:** encapsulator

Example: **encapsulator**



```
SLC serial user configuration
SLC Config>
```

Be aware of the following when you configure PSL or PPP:

- The V.25 *bis* interface predefines clocking as external and encoding as NRZ. The DCE controls the clock speed. The V.25 *bis* interface ignores those parameters in the PPP or PSL configuration.
- The V.25 *bis* interface does not enforce transmit delay counters that you set in the PSL or PPP configurations.
- Make sure that the PSL frame size of the dial circuits on all routers is set to at least 602. (The default is 2048.) The PSL protocol requires an initial exchange of messages of this size.
- Do not enable pseudo-serial-ethernet on the dial circuit.

To return to the `Circuit Config>` prompt, use the **exit** command.

## List

Display the current dial circuit configuration.

**Syntax:** `list`

Example: `list`

```
Base net:          6
Destination name:  remote-site-baltimore
Inbound dst name:  * ANY *
Inbound dst name:  local-1
Outbound calls    allowed
Inbound calls     allowed
Idle timer        = 60 sec
SelfTest Delay Timer = 0 ms
```

*Base net:* Name of the serial line interface to which this dial circuit is mapped.

*Destination name:* Network address name to be called for outbound circuits, and the default comparison address used by the caller-ID mechanism for inbound calls.

|                             |  |
|-----------------------------|--|
| <i>Inbound dst name:</i>    | This parameter appears only if the circuit is configured to accept inbound calls that do not match any other addresses.          |
| <i>Inbound dst name:</i>    | Alternate comparison address name used by the caller-ID mechanism for inbound calls.   |
| <i>Outbound calls</i>       | Displays this parameter when the circuit is configured to initiate outbound calls.   |
| <i>Inbound calls</i>        | Displays this parameter when the circuit is configured to accept inbound calls.  |
| <i>Idle timer</i>           | Displays the idle timer setting in seconds. The range is 0 to 65535; 0 indicates that this is a dedicated circuit (leased line). |
| <i>SelfTest Delay Timer</i> | Displays the self-test delay timer setting in milliseconds. The range is 0 to 65535; 0 indicates no delay.                       |

## Set

Map the dial circuit to a V.25 *bis* serial line interface; configure the dial circuit for inbound and/or outbound calls; and set destination addresses, inbound addresses, idle timeout, and self-test delay.

**Syntax:**    set            net...  
                                   calls...  
                                   destination...  
                                   inbound destination...  
                                   any\_inbound  
                                   idle...  
                                   selftest-delay...

### **net # of serial line interface**

Specifies the number of the V.25 *bis* serial line interface to which you want to map this circuit.

Example: **set net 2**

**calls *outbound or inbound or both***

Restricts this dial circuit to initiating outbound calls only, accepting inbound calls only, or both initiating and accepting calls. The default is both.

Example: `set calls outbound`

**destination *address name***

This parameter is required for the dial circuit to operate. It specifies the network dial address of the remote router to which this dial circuit will connect. The caller-ID protocol uses this parameter as the default comparison address for incoming calls. This parameter must match an address name that you assigned at the `Config>` prompt using the **add v25-bis address** command.

Example: `set destination remote-site-baltimore`

**inbound destination *address name***

Set this parameter if the dial circuit is set up for both inbound and outbound calls and if this router's local dial address is different from the destination dial address that the remote router dials. For example, the numbers are different if one of the routers goes through a PBX, international, or inter-LATA exchange. This parameter overrides the default comparison address that the caller-ID protocol uses for incoming calls. This parameter must match an address name that you assigned at the `Config>` prompt using the **add v25-bis address** command.

Example: `set inbound remote-site-1`

**any\_inbound**

Specifies that inbound calls that do not match any other dial circuit are mapped to this circuit and accepted as inbound calls.

Example: `set any_inbound`

**idle *# of seconds***

Specifies a timeout period for the circuit. If there is no protocol traffic over the circuit for this specified time period, the dial circuit hangs up. The range is 0 to 65535, and default is 60 seconds. A zero setting specifies that there is no timeout period and that this is a dedicated circuit (leased line).

**Note:** For WAN-Restoral operations, you must set the idle timeout to 0.

Example: `set idle 60`

#### **selftest-delay # of milliseconds**

You can use this parameter to delay the time between when the call is established and the initial packet is sent. The range is 0 to 65535, and the default is 150. If your modems take extra time to synchronize, adjust this setting.

#### **Exit**

Return to the `Config>` prompt.

**Syntax:** `exit`

Example: `exit`

## **V.25 bis Configuration Commands**

This section explains the V.25 bis configuration commands. These commands allow you to display, create, or modify a V.25 bis configuration. Enter the V.25 bis configuration commands at the `v.25bis Config>` prompt.

Table 12–2 summarizes the V.25 bis configuration commands.

**Table 12–2 V.25 bis Configuration Commands Summary**

| Command         | Function   |
|-----------------|--|
| <b>? (Help)</b> | Lists the configuration commands or lists the options associated with that command.  |
| <b>List</b>     | Displays the V.25 bis configuration.   |
| <b>Set</b>      | Sets the local address, connect, disconnect, and no answer timeouts, number of retries after no answer, and command delay timeout. |
| <b>Exit</b>     | Exits the V.25 bis configuration process and returns to the <code>Config&gt;</code> prompt.  |

## ? (Help)

List the commands that are available from the current prompt level. You can also enter ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
LIST
SET
EXIT
```

Example: **set** ?

```
COMMAND-DELAY-TIMEOUT
CONNECT-TIMEOUT
DISCONNECT-TIMEOUT
LOCAL-ADDRESS
RETRIES-NO-ANSWER
TIMEOUT-NO-ANSWER
```

## List

Display the current V.25 *bis* configuration.

**Syntax:** `list`

Example: **list**

```
                V.25bis Configuration

Local Network Address Name    = v403
Local Network Address        = 1-508-898-2403

Non-Responding addresses:
Retries                      = 1
Timeout                      = 0 seconds

Call timeouts:
Command Delay                = 0 ms
Connect                      = 60 seconds
Disconnect                   = 2 seconds
```

*Local Network Address Name:* Displays the network address name of the local port.

*Local Network Address:* Displays the network dial address of the local port.

*Non-responding  
addresses:*

*Retries*           Maximum number of calls the router attempts to make to a non-responding address during the timeout period.

*Timeout*           If the router reaches the maximum number of retries to a non-responding address, it does not attempt to establish the call until this time has expired. This timeout period begins when the router attempts the first call.

*Call timeouts:*

*Command  
Delay*           Amount of time, in milliseconds, that the router waits to initiate or answer a call after it turns on DTR (Data Terminal Ready). If you set this parameter to 0, the router waits for the modem to respond to DTR with the CTS (Clear to Send) signal before it issues commands.

*Connect*           Number of seconds allowed for a call to be established. If this parameter is set to 0, the modem controls the connection establishment timeout.

*Disconnect*       After the routers drops DTR it waits this amount of time before it initiates further calls. If you set this parameter to 0, the router waits for the modem to respond to the DTR drop by dropping CTS and DSR before it initiates the next call.

## Set

Configure local addresses, timeouts and delays for calls, and retries and timeouts for non-responding addresses.

**Syntax:**    set            command-delay-timeout . . .  
                  connect-timeout . . .  
                  disconnect-timeout . . .  
                  local-address . . .  
                  retries-no-answer . . .  
                  timeout-no-answer . . .

### **command-delay-timeout** *# of milliseconds*

After the router turns on DTR (Data Terminal Ready), it waits this specified amount of time before it initiates or answers a call. If you set this parameter to 0, the router waits for the modem to respond to DTR with the CTS (Clear to Send) signal before it issues commands. The range is 0 to 65535 milliseconds, and the default is 0.

Example: `set command-delay-timeout 0`

### **connect-timeout** *# of seconds*

Sets the number of seconds allowed for a call to be established. The range is 0 to 65535 seconds, and the default is 60. If you set this parameter to 0, the modem controls the connection timeout. Initially set this parameter to 0 and then use ELS event V25B.027 to find out how long it takes to establish connections to various destinations. You can then set this parameter to a number slightly higher than the longest connect time.

**Note:** Normally government regulation limits modem manufacturers to a maximum length for call setup. This value is merely an optimization, although interoperation with some DSUs may require that you change this parameter.

Example: `set connect-timeout 10`

**disconnect-timeout** *# of seconds*

Specifies the amount of time, in seconds, that the router waits after dropping DTR before it initiates further calls. The range is 0 to 65535 seconds, and the default is 2. If you set this parameter to 0, the router waits for the modem to respond to the DTR drop by dropping CTS and DSR before it initiates the next call.

Example: `set disconnect-timeout 500`

**local-address** *address name*

This is the network address name of the local port. This address name must match one of the names that you defined at the `Config>` prompt using the **add V25-bis-address** command.

Example: `set local-address line-1-local`

**retries-no-answer** *value*

Some telephone service providers impose restrictions on automatic recalling devices to limit the number of successive calls to an address that is inaccessible or that refuses those calls. This parameter specifies the maximum number of calls the router attempts to make to a non-responding address during the timeout period. The range is 0 to 10, and the default is 1.

**Note:** Government regulation may also impose limits on the modem manufacturer that supersede this parameter.

Example: `set retries-no-answer 2`

**timeout-no-answer** *# of seconds*

After the router reaches the maximum number of `retries-no-answer` to a non-responding address, it inhibits any further calls to that address until this time has expired. This timeout period begins when the router attempts the first call to an address. The range is 0 to 65535 seconds, and the default is 0. If you set this parameter to 0, the modem controls the timeout period.

Example: `set timeout-no-answer 180`



## Exit

Return to the Config> prompt.

**Syntax:** `exit`

Example: `exit`



---

## Monitoring the V.25 *bis* Network Interface

This chapter describes the V.25 *bis* console commands and GWCON commands.

### Accessing the Interface Console Process

To access the interface console process for V.25 *bis*, use the **network** command at the GWCON (+) prompt followed by the number of the V.25 *bis* serial line interface. (You cannot directly access the V.25 *bis* console process for dial circuits, but you can monitor the dial circuits that are mapped to the serial line interface.) Once you have accessed the desired interface console process, you can begin entering console commands.

**Note:** V.25 *bis* interfaces also have ELS troubleshooting messages that you can use to monitor V.25 *bis*-related activity. See the *Event Logging System Messages Guide* for further details.

### V.25 *bis* Console Commands

This section explains the V.25 *bis* console commands. These commands allow you to view the calls, circuits, parameters, and statistics of the V.25 *bis* interfaces. Enter the V.25 *bis* console commands at the `v.25bis>` prompt.

Table 13–1 summarizes the V.25 *bis* console commands.

**Table 13–1 V.25 *bis* Console Command Summary**

| <b>Command</b>    | <b>Function</b>   |
|-------------------|---|
| <b>? (Help)</b>   | Lists the V.25 <i>bis</i> console commands or lists the options associated with specific commands.  |
| <b>Calls</b>      | List the number of completed and attempted connections made for each dial circuit mapped to this interface since the last time statistics were reset on the router. |
| <b>Circuits</b>   | Shows the status of all data circuits configured on the V.25 <i>bis</i> interface.  |
| <b>Parameters</b> | Displays the current parameters for the V.25 <i>bis</i> interface. (This command is similar to the <code>V.25bis Config&gt; list</code> command.)                   |
| <b>Statistics</b> | Displays the current statistics for the V.25 <i>bis</i> interface.  |
| <b>Exit</b>       | Exits the V.25 <i>bis</i> console process and returns to the GWCON (+) process.   |

### ? (Help)

List the available commands. You can also enter ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
CALLS
CIRCUITS
PARAMETERS
STATISTICS
EXIT
```

### Calls

List the number of completed and attempted connections made for each dial circuit mapped to this interface since the last time statistics were reset on the router.

**Syntax:** calls

Example: **calls**

```
Net Interface Site Name      In    Out   Rfsd  Blckd
  1     SL/0   v403          2     0     0     0

Unmapped connection indications:  0
```

*Net*                    Number of the dial circuit mapped to this interface.

*Interface*            Type of interface and its instance number.

*Site Name*            Network address name of the dial circuit.

*In*                    Number of inbound connections accepted for this dial circuit.

*Out*                   Number of completed connections initiated by this dial circuit.

*Rfsd*                  Number of connections initiated by this dial circuit that were refused by the network or the remote destination port.

*Blckd*                Number of connection attempts that the router blocked. The router blocks connection attempts if the local port is already in use, the maximum number of retries to a non-responding address is reached, or a modem is not responding.

*Unmapped connection indications:*    Number of connection attempts that were refused by the router because there were no enabled dial circuits that were configured to accept the incoming calls.

**Circuits**

Shows the status of all dial circuits configured on the V.25 *bis* port.

**Syntax:**    circuits

Example: **circuit**

```
Net Interface MAC/Data-Link State Reason Duration
  1     SL/0   Proteon Serial Avail   Rmt Disc  1:02:25
```

*Net*                    Number of the dial circuit mapped to this interface

*Interface*            Type of interface and its instance number.

|                      |   |
|----------------------|---|
| <i>MAC/Data-Link</i> | Type of data-link protocol configured for this dial circuit.  |
| <i>State</i>         | Current state of the dial circuit: <ul style="list-style-type: none"> <li>• <b>Up</b> – Currently connected</li> <li>• <b>Available</b> – Not currently connected, but available</li> <li>• <b>Disabled</b> – Dial circuit disabled</li> <li>• <b>Down</b> – Failed to connect because of a busy dial circuit or because the link-layer protocol is down</li> </ul>   |
| <i>Reason</i>        | Reason for the current state: <ul style="list-style-type: none"> <li>• <b>nnn_Data</b> – (where <i>nnn</i> is the name of a protocol) The circuit is Up because a protocol had data to send.</li> <li>• <b>Remote Disconnect</b> – The circuit is either Down or Available because the remote destination disconnected the call.</li> <li>• <b>Operator Request</b> – The circuit is Available because the last call was disconnected by a console command.</li> <li>• <b>Inbound</b> – The circuit is Up because the circuit answered an inbound call.</li> <li>• <b>Restoral</b> – The circuit is Up because of a WAN-Restoral operation.</li> <li>• <b>Self Test</b> – The circuit was configured as static (idle time=0) and successfully connected once it was enabled.</li> </ul> |
| <i>Duration</i>      | Length of time that the circuit was in the current state.   |

## Parameters

Display the current V.25 *bis* serial line configuration. Note that this is the same information displayed at the V.25bis Config> prompt using the **list** command.

**Syntax:** `parameters`

**Example:** `parameters`

```
V.25 bis port Parameters
Local Network Address Name    = v402
Local Network Address         = 1-508-898-2402

Non-Responding addresses:
Retries                       = 1
Timeout                       = 0 seconds

Call timeouts:
Command Delay                 = 0 ms
Connect                       = 0 seconds
Disconnect                    = 0 seconds
```

|                                    |   |
|------------------------------------|---|
| <i>Local Network Address Name:</i> | Network address name of the local port.   |
| <i>Local Network Address:</i>      | Network dial address of the local port.   |
| <i>Non-responding addresses:</i>   |   |
| <i>Retries</i>                     | Maximum number of calls the router attempts to make to a non-responding address during the timeout period.  |
| <i>Timeout</i>                     | If the router reaches the maximum number of retries to a non-responding address, it does not attempt to establish the call until this time has expired. This timeout period begins when the router attempts the first call to an address. |

*Call timeouts:*

|                      |  |
|----------------------|--|
| <i>Command Delay</i> | Amount of time, in milliseconds, that the router waits to initiate or answer a call after it turns on DTR (Data Terminal Ready). If you set this parameter to 0, the router waits for the modem to respond to DTR with the CTS (Clear to Send) signal before it issues commands. |
| <i>Connect</i>       | Number of seconds allowed for a call to be established. If this parameter is set to 0, the modem controls the connection establishment timeout.  |
| <i>Disconnect</i>    | After the routers drops DTR it waits this amount of time before it initiates further calls. If you set this parameter to 0, the router waits for the modem to respond to the DTR drop by dropping CTS and DSR before it initiates the next call.                                 |

## Statistics

Display the current statistics for this V.25 *bis* interface.

**Syntax:** `statistics`

**Example:** `statistics`

```
V.25bis Port Statistics

Level converter:      RS-232/V.35  Adapter cable: V.35 DTE

V.24 circuit: 105 106 107 108 109 125
Nicknames:      RTS CTS DSR DTR DCD RI
PUB 41450:      CA CB CC CD CF CE
State:          OFF OFF OFF OFF OFF OFF

Line speed:        ~56.000 Kbps
Last port reset:   1 hour, 28 minutes, 25 seconds ago

Input frame errors:
  CRC error                0      alignment (byte length)  0
  too short (< 2 bytes)    0      too long (> nnnn bytes)  0
  aborted frame            0      DMA/FIFO overrun        0
Output frame counters:
  DMA/FIFO underrun errors  0      Output aborts sent      0
```



|                                  |  |
|----------------------------------|--|
| <i>Level converter:</i>          | Type of level converter connected to the V.25 <i>bis</i> interface.  |
| <i>Adapter cable:</i>            | Type of adapter cable that the level converter is using.   |
| <i>V.24 circuit:</i>             | Circuit numbers as identified by V.24 specifications.  |
| <i>Nicknames:</i>                | Common names for the circuits.   |
| <i>PUB 41450:</i>                | PUB 41450 names for the circuits.  |
| <i>State:</i>                    | Current state of the circuits (ON, OFF, or “—,” which means that the state is undefined for this type of interface). |
| <i>Line speed:</i>               | The transmit clock speed (approximate).  |
| <i>Last port reset:</i>          | Length of time since the port was reset.   |
| <i>Input frame errors:</i>       |  |
| <i>CRC error</i>                 | Number of packets received that contained checksum errors and were discarded.  |
| <i>Alignment (byte length)</i>   | Number of packets received that were not an even multiple of 8 bits in length and were discarded.                    |
| <i>too short (&lt;2 bytes)</i>   | Number of packets received that were less than 2 bytes in length and were discarded.                                 |
| <i>too long (&gt;nnnn bytes)</i> | Number of packets received that were greater than the configured frame size ( <i>nnnn</i> ) and were discarded.      |
| <i>aborted frame</i>             | Number of packets received that were aborted by the sender or a line error.  |

*Output frame  
counters:*

|   |   |
|---|---|
| <i>DMA/FIFO<br/>underrun<br/>errors</i> | Number of times the serial interface card did not retrieve data fast enough from the system packet buffer memory to transmit them onto the network. |
| <i>Output aborts<br/>sent</i>           | Number of transmissions that were aborted as requested by upper-level software.   |

## Exit

Return to the GWCON (+) prompt.

**Syntax:** `exit`

Example: `exit`

## V.25 *bis* and the GWCON Commands

While V.25 *bis* has its own console process for monitoring purposes, the router also displays configuration information and complete statistics for devices and circuits when you use the **interface**, **statistics**, and **error** commands from the GWCON environment. You can also use the GWCON **test** command to test DCEs and circuits.

**Note:** Issuing the **test** command to the V.25 *bis* serial interface causes the current call to be dropped and redialed.

## Statistics for V.25 *bis* Interfaces and Dial Circuits

Use the **interface** command at the GWCON prompt (+) to display statistics for V.25 *bis* serial line interfaces and dial circuits.

To display the following statistics for a V.25 *bis* serial line interface, use the **interface** command followed by the interface number of the V.25 *bis* serial line interface.

Example: **interface 0**

```

                                Self-Test  Self-Test  Maintenance
Nt  Nt' Interface   CSR  Vec  Passed   Failed   Failed 0  0
V.25/0 80000000   44    1    0        0        0

V.25bis MAC/data-link on Serial Line interface

Level converter:      RS-232/V.35  Adapter cable: V.35 DTE

V.24 circuit: 105 106 107 108 109 125
Nicknames:      RTS CTS DSR DTR DCD RI
PUB 41450:     CA CB CC CD CF CE
State:         OFF OFF OFF OFF OFF OFF

Line speed:         ~14.400 Kbps
Last port reset:   1 hour, 28 minutes, 25 seconds ago

Input frame errors:
CRC error          0 alignment (byte length)  0
too short (< 2 bytes) 0 too long (> nnnn bytes) 0
aborted frame     0 DMA/FIFO overrun      0
Output frame counters:
DMA/FIFO underrun errors 0 Output aborts sent      0
```

To display the following statistics for a dial circuit, use the **interface** command followed by the interface number of the dial circuit.

Example: **interface 1**

```

                                Self-Test  Self-Test  Maintenance
Nt  Nt' Interface   CSR  Vec  Passed   Failed   Failed
1  0  SL/0         80000000  44    1        1        0

Proteon Serial MAC/data-link on V.25bis dial interface

Line Speed          : ~56.000 Kbps
Last port reset    : 0 seconds ago
```

The following table describes the output for both serial line interfaces and dial circuits.

|            |  |
|------------|--|
| <i>Nt</i>  | Serial line interface number or dial circuit interface number.   |
| <i>Nt'</i> | If <i>Nt</i> is a dial circuit, this is the interface number of the V.25 <i>bis</i> serial line interface to which the dial circuit is mapped. |

|                                  |   |
|----------------------------------|---|
| <i>Interface</i>                 | Interface type and its instance number.   |
| <i>CSR</i>                       | Command and status register addresses of base network.  |
| <i>Vec</i>                       | Interrupt vector address.   |
| <i>Self-Test Passed</i>          | Number of self-tests that succeeded.  |
| <i>Self-Test Failed</i>          | Number of self-tests that failed.   |
| <i>Maintenance: Failed</i>       | Number of maintenance failures.   |
| <i>Level converter:</i>          | Type of level converter connected to the V.25 <i>bis</i> interface.   |
| <i>Adapter cable:</i>            | Type of adapter cable that the level converter is using.  |
| <i>V.24 circuit:</i>             | Circuit numbers as identified by V.24 specifications.   |
| <i>Nicknames</i>                 | Common names for the circuits.  |
| <i>PUB 41450</i>                 | PUB 41450 names for the circuits.   |
| <i>State</i>                     | Current state of the circuits (ON or OFF).  |
| <i>Line speed</i>                | The transmit clock speed (approximate).   |
| <i>Last port reset</i>           | Length of time since the port was reset.  |
| <i>Input frame errors:</i>       |   |
| <i>CRC error</i>                 | Number of packets received that contained checksum errors and as a result were discarded.                     |
| <i>Alignment (byte length)</i>   | Number of packets received that were not an even multiple of 8 bits in length and as a result were discarded. |
| <i>too short (&lt;2 bytes)</i>   | Number of packets received that were less than 2 bytes in length and as a result were discarded.              |
| <i>too long (&gt;nnnn bytes)</i> | Number of packets received that were greater than the configured frame size and as a result were discarded.   |

*aborted frame*      Number of packets received that were aborted by the sender or a line error.

*Output frame  
counters:*

*DMA/FIFO  
underrun  
errors*              Number of times the serial interface card did not retrieve data fast enough from the system packet buffer memory to transmit them onto the network.

*Output aborts  
sent*                Number of transmissions that were aborted as requested by upper-level software.



---

## Configuring Serial Line Interfaces

This chapter describes the commands to configure serial interfaces. Enter these commands after the `SLC Config>` prompt.

**Important:** To configure Frame Relay, PPP, X.25, and SDLC for DLSw on the serial interface, use the commands in this chapter and then refer to the commands in the chapters that describe the specific protocol.

### Accessing the Interface Configuration Process

Follow the procedure described in the *System Software Guide* to access the interface configuration process and display the `SLC Config>` prompt. When you are done configuring the serial interface, enter the **restart** command after the `OPCON` prompt (\*) and respond **yes** to the prompt to enable the new configuration.

**Note:** After you access the interface configuration process, you may begin entering configuration commands. Whenever you make a change to a user-configurable interface parameter, you must restart the router for this change to take effect.

### Network Interfaces and the GWCON Interface Command

While serial line interfaces do not have their own console process for monitoring purposes, routers may display complete statistics for all installed network interfaces when you use the **interface** command from the `GWCON` environment.

## Serial Line Configuration Commands

This section explains the serial line configuration commands. Enter these commands at the `SLC Config>` prompt.

Table 14–1 lists the serial configuration commands.

**Table 14–1 Serial Configuration Command Summary**

| Command         | Function  |
|-----------------|---|
| <b>? (Help)</b> | Displays all the serial commands or lists subcommand options for specific commands.   |
| <b>Disable</b>  | Disables pseudo-serial-ethernet.  |
| <b>Enable</b>   | Enables pseudo-serial-ethernet.   |
| <b>List</b>     | Displays the current serial interface configuration.  |
| <b>Set</b>      | Sets the clock rate, encoding scheme, frame-size, data link idle state, pseudo-serial-ethernet MAC address and IPX encapsulation, line speed, and the time that elapses between the transmission of each frame. |
| <b>Exit</b>     | Exits the serial config process.  |

### ? (Help)

List the commands that are available from the current prompt level. You can also enter a `?` after a specific command name to list its options.

**Syntax:** ?

**Example:** ?

```
DISABLE
ENABLE
LIST
RESERVE
SET
EXIT
```



Example: **set ?**

```
ENCODING
FRAME-SIZE
IDLE
PSEUDO-SERIAL-ETHERNET
SPEED
TRANSMIT-DELAY
```

## Disable

Disable pseudo-serial-ethernet.

**Syntax:** `disable pseudo-serial-ethernet`

Example: **disable ps**

## Enable

Use the **enable** command to send and receive routed frames in the Ethernet bridged packet format. This allows the pseudo-serial-ethernet end to be a serial line router, and the other end to be a bridge to Ethernet (only).

**Note:** Before you can enable pseudo-serial-ethernet, set the MAC address using the **set pseudo-serial-ethernet** command.

**Syntax:** `enable pseudo-serial-ethernet`

Example: **enable ps**

## List

Display the current configuration for the serial interface.

**Syntax:** `list`

Example: **list**

```
Synchronous serial line interface configuration:

Maximum network layer frame size:      18000
Transmit delay counter:                 0 units
HDLC Data Encoding:                    NRZ
HDLC Idle State:                       Flag
Speed:                                  0

Pseudo Serial Ethernet :               Enabled
Ethernet MAC address:                  200931234567
Ethernet IPX encapsulation:            Ethernet _II
```

**Note:** The two lines in italic appear only when pseudo serial Ethernet is enabled.

|   |  |
|---|--|
| <i>Maximum network layer frame size</i> | The maximum size of the frames transmitted on the data link, as specified by the <b>set frame-size</b> command.                      |
| <i>Transmit delay counter</i>           | The minimum time that elapses between the transmission of each frame.  |
| <i>HDLC Data Encoding</i>               | The transmission encoding scheme for the serial interface. Scheme is NRZ (non-return to zero) or NRZI (non-return to zero inverted). |
| <i>HDLC Idle State</i>                  | The data link idle state: flag or mark.  |
| <i>Speed</i>                            | The rate generated on the transmit and/or receive lines.   |
| <i>Pseudo Serial Ethernet</i>           | Indicates whether pseudo-serial-ethernet is enabled or disabled. If it is enabled, the next two lines appear as output.              |
| <i>Ethernet MAC address</i>             | A 12-digit hexadecimal value.  |
| <i>Ethernet IPX encapsulation</i>       | The configured IPX encapsulation.  |

## Set

Configure the encoding scheme, frame-size, data link idle state, pseudo-serial-Ethernet MAC address and IPX encapsulation, speed, and the time that elapses between the transmission of each frame.

**Syntax:**    set        \_encoding  
                          \_frame-size  
                          \_idle  
                          \_pseudo *MAC-address*  
                          \_pseudo frame *encapsulation-type*  
                          \_transmit-delay

### encoding *NRZ* or *NRZI*

Sets the HDLC transmission encoding scheme as NRZ (Non-return to zero) or NRZI (Non-return to zero inverted). Most configurations use NRZ which is the default.

Example: `set encoding nrz`

### frame-size #

Sets the size of the network layer portion of frames transmitted and received on the data link. Data link and MAC layer headers are not included. The valid entries for # for the serial interface is fixed at 2046.

Example: `set frame-size 2000`

### idle *flag* or *mark*

Sets the transmit idle state for HDLC framing. The default is flag which provides continuous flags (7E hex) between frames. The mark option puts the line in a marking state (OFF, 1) between frames.

Example: `set idle flag`

### pseudo *MAC-address*

Specifies a 12-digit hexadecimal MAC address. Interfaces use this as the "Ethernet" MAC address when frames are sent as bridged Ethernet.

Example: `set pseudo MAC 203456345567`

### **pseudo frame encapsulation-type**

Specifies the Ethernet IPX encapsulation. The choices include:

|                       |  |
|-----------------------|--|
| <i>Ethernet _8022</i> | Packet format includes an 802.2 header. This is the default for NetWare versions 4.0 and later.  |
| <i>Ethernet _8023</i> | Uses an IEEE 802.3 packet format without the 802.2 header. This is the command default, and also the default for NetWare versions prior to 4.0. Ethernet 802.3 does not conform to the IEEE 802. standards because it does not include an 802.2 header. It may cause problems with other nodes on the network. |
| <i>Ethernet _II</i>   | Uses Ethernet type 8137 as the packet format. This format is required if you are using NetWare-VMS on the Ethernet.  |
| <i>Ethernet _SNAP</i> | Uses the 802.2 format with a SNAP header. This encapsulation type is meant to be compatible with token-ring SNAP encapsulation. However, it violates IEEE standards and is not interoperable across conformant bridges.  |

Example: `set pseudo frame Ethernet _8022`

### **transmit-delay #**

Allows the insertion of a delay between transmitted packets. The purpose of this command is to slow the serial line so that it is compatible with older, slower serial devices at the other end. It can also prevent the loss of serial line hello packets between the lines.

A value of 0 transmits frames separated by as few as one HDLC flag. A value of 1 causes a minimum of two HDLC flags between transmitted frames.

For the RouteAbout Access EW serial interface, # is between 0 and 65535. Zero disables and 1 to 65535 allows you to select the delay between frames, independent of line speed. This delay is produced in units of 5 milliseconds.

Table 14–2 lists the starting transmit delay values for each type of interface. If you have problems with frames missing in the interface card counters, increase the transmit delay value.

Example: `set transmit 1`

**Table 14–2 Transmit Delay Values**

| <b>Model Number</b>  | <b>Transmit-Delay Value</b> |
|----------------------|-----------------------------|
| RouteAbout Access EW | 6                           |
| RouteAbout Access TW | 40                          |

## **Exit**

Return to the previous prompt level.

**Syntax:** `exit`

Example: `exit`



---

## Monitoring Serial Line Interfaces

This chapter describes how to monitor the serial line interfaces.

### Serial Interfaces and the GWCON Interface Command

While the serial line interface does not have its own console process for monitoring purposes, bridging routers display complete statistics for all installed network interfaces when you use the **interface** command from the GWCON environment.

### Statistics for the Serial Interfaces

This section describes the statistics for the serial interfaces. To view these statistics, enter the **interface** command at the GWCON prompt (+).

### Serial Interface Line Interface Example

The following example shows the output for the serial interface.

| Nt | Nt' | Interface | CSR      | Vec | Self-Test<br>Passed | Self-Test<br>Failed | Maintenance<br>Failed |
|----|-----|-----------|----------|-----|---------------------|---------------------|-----------------------|
| 0  | 0   | SL/0      | 80001000 | 44  | 1                   | 2                   | 1                     |
| 1  | 1   | v25       | 80002000 | 48  | 1                   | 0                   | 0                     |
| 2  | 1   | SL        | 80002000 | 48  | 2                   | 0                   | 0                     |
| 3  | 1   | SL        | 80002000 | 48  | 2                   | 9                   | 0                     |

Line Speed: ~2.20 Mbps

Last port reset: 4 days, 5 hours, 4 minutes, 55 seconds ago

Interface Type: V.35

Active Signals (DCD/CTS/DSR): DSR CTS DCD

|                       |        |                     |        |
|-----------------------|--------|---------------------|--------|
| Total Transmits       | 179235 | Total Receives      | 102372 |
| Tx Abort Requested    | 0      | Tx Abort (No CTS)   | 0      |
| Tx FIFO Underruns     | 0      |                     |        |
| Rcv CRC/Frame Errors  | 0      | Rcv FIFO Overruns   | 0      |
| Rcv Buffer Overruns   | 0      | Rcv Packets Dropped | 0      |
| DDL C Bus/Addr Faults | 0      | Tl/E1 Intf ROM Rev  | 1.7    |
| DDL Rcv Overruns      | 0      |                     |        |

The next section describes the preceding output.

|                                |   |
|--------------------------------|---|
| <i>Nt</i>                      | Global network number.                            |
| <i>Nt'</i>                     | Number for Nt' is identical to the number for Nt. |
| <i>Interface</i>               | Interface name and its port number.               |
| <i>CSR</i>                     | Command and status register addresses.            |
| <i>Vec</i>                     | Interrupt vector address.                         |
| <i>Self-Test:<br/>Passed</i>   | Number of self-tests that succeeded.              |
| <i>Self-Test:<br/>Failed</i>   | Number of self-tests that failed.                 |
| <i>Maintenance:<br/>Failed</i> | Number of maintenance failures.                   |
| <i>Line speed</i>              | Calculated.                                       |



|                                     |  |
|-------------------------------------|--|
| <i>Last port reset</i>              | The days, hours, minutes, and seconds since the last port reset.   |
| <i>Interface type</i>               | Physical type of the interface.  |
| <i>Active signals (DCD/CTS/DSR)</i> | Active signals on the interface: Data Carrier Detect (DCD), Clear-to-Send (CTS), and Data Set Ready (DSR).                                     |
| <i>Total transmits</i>              | Number of packets transmitted over the interface.  |
| <i>Tx abort requested</i>           | Number of local requests for aborting a packet transmission.   |
| <i>Tx FIFO Underruns</i>            | Number of times that data was not provided for transmission because the processor and transmitter were not in sync. The packets are discarded. |
| <i>Rcv CRC/Frame errors</i>         | Number of checksum and frame errors received on all incoming packets. The packets are discarded.   |
| <i>Rcv Buffer Overruns</i>          | Number of times that a packet was too long to fit into the buffer. The packets are discarded.  |
| <i>DDLC Bus/Addr faults</i>         | Number of times the DDLC (Dual Data-Link Controller) attempted an illegal access. These faults indicate a hardware problem.                    |
| <i>DDLC Rcv Overruns</i>            | Number of times the DDLC chip ran out of internal buffers.   |
| <i>Total receives</i>               | Number packets received over the interface.  |
| <i>Tx abort (no CTS)</i>            | Number of transmits that were aborted because a clear-to-send signal was not received.   |
| <i>Rcv FIFO Overruns</i>            | Number of times that the local system bus was unavailable to transfer packets. The packet is then discarded.                                   |
| <i>Rcv packets dropped</i>          | Number of receive (Rcv) packets that were dropped.   |
| <i>T1/E1 Intf ROM Rev</i>           | PROM revision level of the serial interface.   |

## RouteAbout Access EW Serial Line Interfaces

The following example shows output for the RouteAbout Access EW serial interface. Descriptions of the output start on the next page.

### + interface

| Nt | Nt' | Interface | CSR      | Vec | Self-Test |        | Maintenance |
|----|-----|-----------|----------|-----|-----------|--------|-------------|
|    |     |           |          |     | Passed    | Failed | Failed      |
| 0  | 0   | TKR/0     | 80001000 | 44  | 1         | 2      | 1           |
| 1  | 1   | v25       | 80002000 | 48  | 1         | 0      | 0           |
| 2  | 1   | SL        | 80002000 | 48  | 2         | 2      | 0           |
| 3  | 1   | SL        | 80002000 | 48  | 2         | 9      | 0           |

### + interface 2

| Nt | Nt' | Interface | CSR     | Vec | Self-Test |        | Maintenance |
|----|-----|-----------|---------|-----|-----------|--------|-------------|
|    |     |           |         |     | Passed    | Failed | Failed      |
| 2  | 2   | SL/0      | 1001640 | 5C  | 0         | 5      | 0           |

Proteon Serial MAC/data-link on SCC Serial Line interface

Adapter cable: V.35 DTE RISC Microcode Revision:  
2

V.24 circuit: 105 106 107 108 109 125 141  
Nicknames: RTS CTS DSR DTR DCD RI LL  
PUB 41450: CA CB CC CD CF CE  
State: ON ON ON ON ON OFF OFF

Line speed: ~1.859 Mbps  
Last port reset: 11 seconds ago

#### Input frame errors:

|                    |   |                         |   |
|--------------------|---|-------------------------|---|
| CRC error          | 0 | alignment (byte length) | 2 |
| missed frame       | 0 | too long (> 2052 bytes) | 0 |
| aborted frame      | 0 | DMA/FIFO overrun        | 0 |
| L & F bits not set | 0 |                         |   |

#### Output frame counters:

|                          |   |                    |   |
|--------------------------|---|--------------------|---|
| DMA/FIFO underrun errors | 0 | Output aborts sent | 0 |
|--------------------------|---|--------------------|---|

+

*Nt* Global network number.

*Nt'* Network on which a V.25 circuit is configured. The previous output indicates the following:  
*Nt* 0 is a standard token-ring network.  
*Nt* 1 is the network on which the base V.25 device is configured.  
*Nt* 2 and *Nt* 3 are V.25 circuits configured for serial lines. This is indicated because the *Nt'* number is identical to the number in the *Nt* field for the base V.25 interface. Also, the *CSR* and *Vec* fields are identical to *Nt* 1. Refer to the following example.

| <i>Nt</i> | <i>Nt'</i> | Interface | <i>CSR</i> | <i>Vec</i> |
|-----------|------------|-----------|------------|------------|
| 0         | 0          | TKR/0     | 80001000   | 44         |
| ①         | 1          | v25       | 80002000   | 48         |
| 2         | ①          | SL        | 80002000   | 48         |
| 3         | ①          | SL        | 80002000   | 48         |

*Interface* Interface name and its port number.

*CSR* Command and status register addresses.

*Vec* Interrupt vector address.

*Self-Test Passed* Number of self-tests that succeeded.

*Self-Test Failed* Number of self-tests that failed.

*Maintenance Failed* Number of maintenance failures.

*Adapter cable* Adapter cable type.

|   |   |
|---|---|
| <i>V.24 circuit<br/>Nicknames<br/>Pin Assignments<br/>State</i> | Circuits, control signals, pin assignments and their state (ON or OFF). Table 15–1 describes the output for each adapter cable type.<br><br><b>Note:</b> The symbol --- in console output indicates that the value or state is unknown. |
| <i>Line speed</i>   | Transmit clock rate.  |
| <i>Last port reset</i>  | Length of time since the last port reset.   |
| <i>Input frame errors</i>                                       |   |
| <i>CRC error</i>  | Number of packets received that contained checksum errors and as a result were discarded.   |
| <i>alignment<br/>(byte length)</i>                              | Number of packets received that were not an even multiple of 8 bits in length and a result were discarded.  |
| <i>missed frame</i>   | Number of packets that were less than 2 bytes in length and as a result were discarded.   |
| <i>too long<br/>(&gt; 2052<br/>bytes)</i>                       | Number of packets that were greater than the configured size, and as a result were discarded.   |
| <i>aborted frame</i>  | Number of packets received that were aborted by the sender or a line error.   |
| <i>DMA/FIFO<br/>overrun</i>                                     | Number of times the serial interface could not send data fast enough to the system packet buffer memory to receive them from the network.   |
| <i>L &amp; F bits not<br/>set</i>                               | Internal consistency check failed.  |

*Output frame  
counters*

*DMA/FIFO  
underrun  
errors*      Number of times the serial interface card could not  
retrieve data fast enough from the system packet buffer  
memory to transmit them onto the network.

*Output aborts  
sent*      Number of transmissions that were aborted as  
requested by upper-level software.

Table 15–1 lists the V.24 circuits, nicknames, nickname descriptions, cable types and cable circuit function descriptions.

**Table 15–1 V.24 Circuits and States**

| <b>Cable Type: RS-232 DTE</b> |                 |                                |               |                                |
|-------------------------------|-----------------|--------------------------------|---------------|--------------------------------|
| <b>V.24Circuit</b>            | <b>Nickname</b> | <b>Description</b>             | <b>RS-232</b> | <b>Description</b>             |
| 105                           | RTS             | Request to Send                | CA            | Request to Send                |
| 106                           | CTS             | Clear to Send                  | CB            | Clear to Send                  |
| 107                           | DSR             | Data Set Ready                 | CC            | Data Set Ready                 |
| 108                           | DTR             | Data Terminal Ready            | CD            | Data Terminal Ready            |
| 109                           | DCD             | Data Channel Received Line     | CF            | Received Line                  |
| 125                           | RI              | Signal Detector Ring Indicator | CE            | Signal Detector Ring Indicator |

**Table 13–1 (Cont.) V.24 Circuits and States**

| Cable Type: RS-422 DTE |          |  |               |                            |
|------------------------|----------|--|---------------|----------------------------|
| V.24 Circuit           | Nickname | Description                                      | EIA<br>RS-449 | Description                |
| 105                    | RTS      | Request to Send                                  | RS            | Request to Send            |
| 106                    | CTS      | Clear to Send                                    | CS            | Clear to Send              |
| 107                    | DSR      | Data Set Ready                                   | DM            | Data Mode                  |
| 108/2                  | DTR      | Data Terminal<br>Ready                           | TR            | Terminal Ready             |
| 109                    | DCD      | Data Channel<br>Received Line<br>Signal Detector | RR            | Receiver Ready             |
| 111                    |          |  | SR            | Signaling Rate<br>Selector |
| 116                    |          |  | SS            | Select Standby             |
| 125                    | RI       | Ring Indicator                                   | IC            | Incoming Call              |
| 135                    |          |  | IS            | Terminal In Service        |
| 140                    |          |  | RL            | Remote Loopback            |
| 141                    |          |  | LL            | Local Loopback             |
| 142                    |          |  | TM            | Test Mode                  |

(continued on next page)

**Table 13–1 (Cont.) V.24 Circuits and States**

| <b>Cable Type: V.35 DTE</b> |                 |  |                      |                               |
|-----------------------------|-----------------|--|----------------------|-------------------------------|
| <b>V.24 Circuit</b>         | <b>Nickname</b> | <b>Description</b>                         | <b>PUB<br/>41450</b> | <b>Description</b>            |
| 105                         | RTS             | Request to Send                            | CA                   | Request to Send               |
| 106                         | CTS             | Clear to Send                              | CB                   | Clear to Send                 |
| 107                         | DSR             | Data Set Ready                             | CC                   | Data Set Ready                |
| 108                         | DTR             | Data Terminal Ready                        | CD                   | Data Terminal Ready           |
| 109                         | DCD             | Data Channel Received Line Signal Detector | CF                   | Received Line Signal Detector |
| 125<br>141                  | RI              | Ring Indicator                             | CE                   | Ring Indicator                |

| <b>Cable Type: X.21 DTE</b> |                             |
|-----------------------------|-----------------------------|
| <b>Field</b>                | <b>Description</b>          |
| Control:                    | Control from DTE to DCE.    |
| Indication:                 | Indication from DCE to DTE. |

| <b>Cable Type: 75 Ohm Coax</b> |                 |  |                      |                               |
|--------------------------------|-----------------|--|----------------------|-------------------------------|
| <b>V.24 Circuit</b>            | <b>Nickname</b> | <b>Description</b>                         | <b>PUB<br/>41450</b> | <b>Description</b>            |
| 109                            | DCD             | Data Channel Received Line Signal Detector | CF                   | Received Line Signal Detector |
| 140                            | L–Loop          | Local loopback                             | CE                   | Ring Indicator                |
| N/A                            | R–Loop          | Provide remote Loopback                    |                      |                               |

(continued on next page)

**Table 13–1 (Cont.) V.24 Circuits and States**

| <b>Cable Type: 120 Ohm Pair</b>   |                 |   |                      |                                  |
|---|-----------------|---|----------------------|----------------------------------|
| <b>V.24 Circuit</b>   | <b>Nickname</b> | <b>Description</b>                                  | <b>PUB<br/>41450</b> | <b>Description</b>               |
| 109   | DCD             | Data Channel<br>Received<br>Line Signal<br>Detector | CF                   | Received Line<br>Signal Detector |
| 140   | L–Loop          | Local loopback                                      | CE                   | Ring Indicator                   |
| N/A   | R–Loop          | Provide remote<br>Loopback                          |                      |                                  |
| <b>Cable Type: Undefined</b>  |                 |   |                      |                                  |
| The software has not yet detected the cable type, or no cable is connected. |                 |   |                      |                                  |



---

## Configuring IEEE 802.5 Token-Ring Network Interfaces

This chapter describes how to set software configurable information for the token-ring interfaces in the router.

### Accessing the Interface Configuration Process

Follow the procedure described in the Chapter 1 to access the interface configuration process for the interface described in this chapter.

**Note:** After you access the interface configuration process, you may begin entering configuration commands. Whenever you make a change to a user-configurable interface parameter, you must restart the router for this change to take effect.

### Token-Ring Configuration Commands

The following sections explain the token-ring configuration commands. Enter the commands at the `TKR config>` prompt.

Table 16–1 lists token-ring configuration commands.

**Table 16–1 Token-Ring Configuration Command Summary**

| <b>Command</b>            | <b>Function</b>   |
|---------------------------|---|
| <b>? (Help)</b>           | Displays all the token-ring commands or lists subcommand options for specific commands. |
| <b>Connector-location</b> | Sets the connector location.  |
| <b>Frame</b>              | Sets the NetWare IPX encapsulation type.  |
| <b>List</b>               | Displays the selected token-ring interface configuration.                               |
| <b>Media</b>              | Sets the media-type as shielded or unshielded.  |
| <b>Packet-Size</b>        | Changes packet-size defaults for this token-ring network.                               |
| <b>Set</b>                | Sets the aging timer for the RIF cache and the MAC address.                             |
| <b>Source-routing</b>     | Enables or disables source-routing on the interface.                                    |
| <b>Speed</b>              | Sets the interface speed in MB/sec.   |
| <b>Exit</b>               | Exits the token-ring config process.  |

### ? (Help)

List the commands that are available from the current prompt level. You can also enter ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
CONNECTOR-LOCATION
FRAME
LIST
MEDIA
PACKET-SIZE
SET
SOURCE-ROUTING
SPEED
EXIT
```

## Connector-Location

Specify the Ethernet or token ring interface location in your hub module. This command is used in certain interface configurations where the enhanced module supports the backplane. The options available for *location* are FRONT and BACK. All backplane (BACK) interfaces must be located in Slot 0. The default setting is FRONT.

If the backplane is not supported in an interface's configuration (for example, an Ethernet interface is in slot 1) then the **connector-location** command is not present from that interface's configuration process.

**Syntax:** `connector-location location`

Example: `connector-location front`

## Frame

Set the NetWare IPX encapsulation type. Table 16–2 lists the encapsulation types you can use.

**Table 16–2 Frame Command NetWare IPX Encapsulation Types**

| Option                                      | Description   | Syntax                                 |
|---|---|--|
| <b>Token ring using MSB</b>                 | Uses the standard 802.2 IPX header with the non-canonical token ring address bit ordering (MSB).  | <code>frame token_ring msb</code>      |
| <b>Token ring using LSB</b>                 | Uses the 802.2 IPX header with the canonical address bit ordering (LSB).  | <code>frame token_ring lsb</code>      |
| <b>Token ring with 802.2 SNAP using MSB</b> | Uses the 802.2 format with a SNAP header and non-canonical address bit ordering. This encapsulation is used primarily in bridging environments. | <code>frame token_ring_snap msb</code> |
| <b>Token ring with 802.2 SNAP using LSB</b> | Uses the 802.2 format with a SNAP header and canonical address bit ordering.  | <code>frame token_ring_snap lsb</code> |

**Syntax:** `frame encapsulation type`

Example: `frame token_ring msb`

**Note:** You cannot use the **frame** command in a network configuration process to set an encapsulation until you have properly configured the interface through the IPX configuration process.

## List

Display the current configuration for the token ring interface.

**Note:** If the MAC address is 0, the default station address is used.

**Syntax:** `list`

Example: `list`

```
Token-Ring configuration:

Packet size (INFO field):    2052
Speed:                       16 Mb/sec
Media:                       Unshielded
Connector Location:         Front

RIF Aging Timer              120
Source Routing:              Disabled
MAC Address:                  000000000000
```

|                           |   |
|---------------------------|---|
| <i>Packet size</i>        | Indicates the size of the token ring packet.  |
| <i>Speed</i>              | Indicates the speed of the network.   |
| <i>Media</i>              | Indicates the type of media the network uses: shielded or unshielded.<br><br>May display <b>auto-config</b> as a media setting. This indicates that media type is selected automatically. |
| <i>Connector Location</i> | Indicates whether connector used the front panel (front) or back plane (back)   |
| <i>RIF Aging Timer</i>    | Indicates the amount of time that the router holds the information contained in the Routing Information Field (RIF).  |

|                       |   |
|-----------------------|---|
| <i>Source Routing</i> | Indicates the status of the source-routing feature: enabled or disabled.  |
| <i>MAC Address</i>    | Indicates the configured MAC address that was set with the <b>set physical-address</b> command. If all zeros are displayed, the MAC address is the default address. |

## Media

Change network media type. The default media type is STP cable. Valid media type values are *shielded* and *unshielded*. Enter the **media** command followed by the *media-type*.

**Note:** The bridging routers may also use **auto-config** as a media setting. This setting automatically selects the media type.

**Syntax:** `media media-type`

Example: `media unshielded`

## Packet-Size

Change packet-size defaults for all token-ring networks. Enter the **packet-size** command followed by the desired number of bytes.

**Note:** Changing packet size can greatly increase buffer memory requirements.

**Syntax:** `packet-size #bytes`

Example: `packet-size 4399`

## Set

Set the Routing Information Field (RIF) timer and the physical (MAC) address.

**Syntax:** `set physical-address  
rif-timer`

### physical address

Sets the MAC address that is placed in the RIF by nodes running DNA phase IV with AMA.

Example: **set physical-address**

```
MAC address in 00:00:00:00:00:00 []?
```

**Note:** Pressing **RETURN** leaves the value the same. Entering **0** causes the router to use the factory station address. The default is to use the factory station address.

### **rif-timer**

Sets the maximum amount of time (in seconds) that the information in the RIF is maintained before it is refreshed. The default is 120.

Example: **set rif-timer**

```
RIF aging timer value [120]? 120
```

### **Source-routing**

Enable or disable endstation source routing. This is the process by which end stations determine the source route to use to cross source routing bridges. This allows the IP, IPX, AppleTalk Phase 2, and DNA Phase IV protocols to reach nodes on the other side of the source routing bridge.

This switch is completely independent of whether this interface is providing source routing through the SRT forwarder. The default setting is enabled.

Some stations cannot properly receive frames with a Source Routing RIF on them. This is especially common among NetWare drivers. Disabling source routing in this situation allows you to communicate with these stations.

Enable source routing only if there are source routing bridges on this ring that you want to bridge IP, IPX, AppleTalk Phase 2, or DNA Phase IV packets through.

**Syntax:** source-routing     enable  
                                  disable

Example: **source-routing enable**

## Speed

Change data speed. The default speed is 4 Mbps. Enter the **speed** command followed by the *speed-value* (in Mb/sec).

**Syntax:** speed *speed-value*

Example: **speed 16**

## Exit

Use the **exit** command to return to the Config> prompt.

**Syntax:** exit

Example: **exit**





---

## Monitoring IEEE 802.5 Token-Ring Network Interfaces

This chapter describes how to monitor specific Token-ring interfaces in the router by using either the interface console commands or the GWCON **interface** command.

For more information about token-ring, refer to the *Bridging Router Reference Guide*.

### Accessing the Interface Console Process

Follow the procedure described in the Chapter 1 to access the interface console process for the interface described in this chapter. After you access the desired interface console process, you may begin entering console commands.

### Token-Ring Interface Console Commands

This section explains the token-ring console commands. Enter commands at the TKR> prompt. Table 17–1 lists the console commands.

**Table 17–1 Token-Ring Console Command Summary**

| <b>Command</b>  | <b>Function</b>   |
|-----------------|---|
| <b>? (Help)</b> | Displays all the token-ring commands or lists subcommand options for specific commands. |
| <b>Dump</b>     | Displays a dump of the RIF cache.   |
| <b>LLC</b>      | Displays the LLC configuration prompt.  |
| <b>Srt-stat</b> | Displays statistical information for transparent bridging.                              |
| <b>Exit</b>     | Exits the token-ring config process.  |

### ? (Help)

List the commands that are available from the current prompt level. You can also enter a ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
DUMP
LLC
SRT-STAT
EXIT
```

### Dump

Request a dump of the RIF cache contents when source routing is enabled in the `tkr config>` process.

**Syntax:** dump

Example: **dump**

```
MAC address   State      Usage      RIF
0000C90B1A57 ON_RING    Yes        0220
```

|                    |  |
|--------------------|--|
| <i>MAC address</i> | Displays the MAC address of the Token-ring interface.  |
| <i>State</i>       | Displays one of the five interface states: <ul style="list-style-type: none"> <li>• <b>On_ring</b> indicates that a RIF was found for a node on the ring.</li> <li>• <b>Have_route</b> indicates that a RIF was found for a node on a remote ring.</li> <li>• <b>No_route</b> is displayed for a brief period of time as an explorer frame is sent out and the router is waiting for a return.</li> <li>• <b>Discovering</b> indicates that the router sent an explorer frame to rediscover the RIF.</li> <li>• <b>St_route</b> indicates a route obtained from a Spanning tree explorer.</li> </ul> |
| <i>Usage</i>       | Indicates that a RIF was used in a packet. The number is arbitrary and has no functional significance.   |
| <i>RIF</i>         | Displays a code that indicates the Routing Information Field in hexadecimal.   |

## LLC

Access the LLC monitoring prompt. LLC commands are entered at this new prompt. See the “LLC Monitoring Commands” section of this chapter for an explanation of each of these commands.

**Syntax:** llc

Example: llc

```
LLC user monitoring
LLC>
```

## SRT-STAT

Use the **srt-stat** command to display information specific to transparent bridging configured on this interface.

**Syntax:** srt-stat

Example: **srt-stat**

## Exit

Use the **exit** command to return to the previous prompt level.

**Syntax:** exit

Example: **exit**

## LLC Monitoring Commands

This section explains all of the LLC configuration commands. These commands let you configure the LLC when you need to pass packets over an SNA network. Table 17–2 lists token-ring configuration commands.

**Table 17–2 Token-Ring Configuration Command Summary**

| Command        | Function  |
|----------------|---|
| ? (Help)       | Displays all the LLC commands or lists subcommand options for specific commands.                    |
| Clear-counters | Clears all statistical counters.  |
| List           | Displays interface, SAP, and session information.   |
| Set            | Allows the user to dynamically configure LLC parameters that are valid for the life of the session. |
| Exit           | Exits the LLC monitoring process.   |

### ? (Help)

List the commands that are available from the current prompt level. You can also enter a ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

### Clear-Counters

Clear all the LLC statistical counters.

**Syntax:** clear-counters

Example: **clear-counters**

## List

Display Interface, Service Access Point (SAP), and session information.

**Syntax:** list        interface  
                      sap ...  
                      session

### interface

Displays all SAPs opened on this interface.

Example: **list interface**

|     |                    |
|-----|--------------------|
| SAP | Number of Sessions |
| F4  | 1                  |

### SAP *sap\_number*

Displays information for the specified SAP on the interface.

Example: **list sap**

```
SAP value in hex (0-FE) [1]? F4
Interface                0, TKR /0
Reply Timer (T1)         1 sec
Receive ACK Timer (T2)   100 millisecc
Inactivity Timer (Ti)    30 sec
MAX Retry Value (N2)     8
MAX I-Field Size (N1)   2052
Rcvd I-frames before ACK (N3) 1
Transmit Window Size (Tw) 2
Acks Needed to Inc Ww (Nw) 1

Frame      Xmt      Rcvd
UI-frames  4          5
TEST-frames 0          1
XID-frames 0          0
I-frames   291        26
RR-frames  81         291
RNR-frames 0          0
REJ-frames 0          0
SABME-frames 1          0
UA-frames  0          1
DISC-frames 0          0
DM-frames  0          0
FRMR-frames 0          0
I-frames discarded by LLC          0
I-frames Refused by LLC user       0

Cumulative number of sessions      1
Number of active sessions           1
```

| Session ID<br>(int-sap-id) | Local MAC         | Remote MAC        | Remote<br>SAP | State  |
|----------------------------|-------------------|-------------------|---------------|--------|
| 00-F4-0000                 | 00:00:C9:08:41:DB | 10:00:5A:F1:02:37 | F4            | OPENED |

*SAP value in hex (0-FE)* The SAP value of the session.

*Interface* The interface number and type over which the session is running.

*Reply Timer (T1)* Indicates the time it takes for this timer to expire when the LLC fails to receive an acknowledgment or response from the other LLC station.

*Receive ACK Timer (T2)* Indicates the time delay the LLC uses before sending an acknowledgment for a received I-frame.

*Inactivity Timer (Ti)* Indicates the time the LLC waits during inactivity before issuing an RR.

*MAX Retry Value (N2)* The maximum number of retries by the LLC protocol.

*MAX I-Field Size (N1)* Maximum amount of data (in bytes) allowed in the I-field of an LLC2 frame.

*Rcvd I-frame before ACK (N3)* Indicates the value that is used with T2 timer to reduce acknowledgment traffic for received I-frames.

*Transmit Window Size (Tw)* Indicates the maximum number I-frames that can be sent before receiving an RR.

*Acks Needed to Inc Ww (Nw)* Indicates the number of I-frames that the LLC must receive before incrementing Ww by 1.

*Frames - Xmt and Rcvd* Counter that displays the total number of frame types transmitted (Xmt) and (Rcvd).

*I-frames discarded by LLC* Counter that displays the total number of I-frames discarded by the LLC, usually because the sequence number is out of sequence.

|                                      |  |
|--------------------------------------|--|
| <i>I-frames refused by LLC user</i>  | Counter that displays the number of I-frames discarded by the software above the LLC. For example, LNM (LAN Network Manager) and DLSw (Data Link Switching). |
| <i>Cumulative number of sessions</i> | The total number of sessions opened over this SAP.   |
| <i>Number of active sessions</i>     | The total number of currently active sessions that are running over the interface.   |
| <i>Session ID (int-sap-id)</i>       | The session ID for the console interface.  |
| <i>Local MAC</i>                     | The router's LLC MAC address.  |
| <i>Remote MAC</i>                    | The remote LLC's MAC address.  |
| <i>Remote SAP</i>                    | The remote "side's SAP" of the LLC connection.   |
| <i>Remote State</i>                  | The finite state(s) that results from interaction between the LLC peers. There are 21 states that are described below.                                       |
| <i>Link_Closed</i>                   | The remote LLC peer is not known to the local LLC peer and is considered as not existing.  |
| <i>Disconnected</i>                  | The local LLC peer is known to the other peer. This LLC peer can send and receive XID, TEST, SABME, and DISC commands; and XID TEST, UA, and DM responses.   |
| <i>Link_Opening</i>                  | The state of the local LLC peer after sending a SABME or UA in response to a received SABME.   |
| <i>Disconnecting</i>                 | The state of the local LLC after sending a DISC command to the remote LLC peer.  |
| <i>FRMR_Sent</i>                     | The local LLC peer entered the frame reject exception state and sent a FRMR response across the link.  |
| <i>Link_Opened</i>                   | The local LLC peer is in the data transfer phase.  |

|                      |  |
|----------------------|--|
| <i>Local_Busy</i>    | The local LLC peer is unable to receive additional I-frames.   |
| <i>Rejection</i>     | An local LLC peer that received one or more out-of-sequence I-frames.  |
| <i>Checkpointing</i> | The local LLC peer sent a poll to the remote LLC peer and is waiting for an appropriate response.                                      |
| <i>KPT_LB</i>        | A combination of checkpointing and local busy states.  |
| <i>CKPT_REJ</i>      | A combination of the checkpointing and rejection states.   |
| <i>Resetting</i>     | The local LLC peer received a SABME and is reestablishing the link.  |
| <i>Remote_Busy</i>   | The state that occurs when an RNR is received from the remote LLC peer.  |
| <i>LB_RB</i>         | A combination of local_busy and remote_busy states.  |
| <i>REJ_LB</i>        | A combination of rejection and local_busy states.  |
| <i>REJ_RB</i>        | A combination of rejection and remote_busy states.   |
| <i>CKPT_REJ_LB</i>   | A combination of checkpointing, rejection, and local_busy states.  |
| <i>CKPT_CLR</i>      | A combination state resulting from the termination of a local_busy condition while the LLC peer is CKPT_LB.                            |
| <i>CKPT_REJ_CLR</i>  | A combination state resulting from the transfer of an unconfirmed local busy clear while the link station is in the CKPT_REJ_LB state. |
| <i>REJ_LB_RB</i>     | A combination of the rejection, local_busy, and remote_busy states.  |
| <i>FRMR_Received</i> | The local LLC peer has received an FRMR response from the remote LLC peer.   |



## Session

Displays information on the specified LLC session that is open on the interface.

Example: `list session`

```
Session Id: [0]? 0-F4-000
Interface                0, TKR /0
Remote MAC addr          10:00:5A:F1:02:37
Source MAC addr          00:00:C9:08:35:47
Remote SAP                F4
Local SAP                 F4
RIF                      (089E 0101 0022 0010)
Access Priority           0
State                    LINK_OPENED
Replay Timer              1 sec
Receive ACK Timer (T2)    100 millisec
Inactivity Timer (Ti)     30 sec
MAX I-Field Size (N1)    2052
MAX Retry Value (N2)      8
Rcvd I-frames before ACK (N3) 1
Transmit Window Size (Tw) 2
Working Transmit Size (Ww) 2
Acks Needed to Inc Ww (Nw) 1
Current Send Seq (Vs)     9
Current Rcv Seq (Vr)      7
Last ACK'd sent frame (Va) 9
No. of frames in ACK pend q 0
No. of frames in Tx pend q 0
Local Busy                NO
Remote Busy               NO
Poll Retry count          8
Appl output flow stopped NO
Send process running      YES

Frame      Xmt      Rcvd
I-frames   1456    2678
RR-frames  502      403
RNR-frames 0        0
REJ-frames 0        0
I-frames discarded by LLC          0
I-frames Refused by LLC user       0
```

*Session Id*            Indicates the session ID number.

*Interface*            Indicates the number of the interface over which this session is running.

*Remote MAC addr*      Indicates the MAC address of the remote LLC peer.

*Source MAC addr*      Indicates the MAC address of the local LLC.

|                                      |  |
|--------------------------------------|--|
| <i>Remote SAP</i>                    | The remote side SAP of the LLC connection.   |
| <i>Local SAP</i>                     | The local side SAP of the LLC connection.  |
| <i>RIF</i>                           | The actual RIF of the frame.   |
| <i>Access Priority</i>               | Priority of the packet. 0-7 for upper layer control.   |
| <i>State</i>                         | The finite state(s) that results from interaction between the LLC peers. Refer to the <b>list sap</b> previously described in this chapter for more information. |
| <i>Receive ACK timer (T2)</i>        | Indicates the time delay the LLC uses before sending an acknowledgment for a received I-frame.   |
| <i>Inactivity timer (Ti)</i>         | Indicates the time the LLC waits during inactivity before issuing an RR.   |
| <i>MAX I-field size (N1)</i>         | Maximum size of the data field (in bytes) of a frame. Default is the size of the interface.  |
| <i>MAX Retry Value (N2)</i>          | The maximum number of times the LLC transmits an RR without receiving an acknowledgment  |
| <i>Rcvd I-frames before ACK (N3)</i> | Indicates the value that is used with T2 timer to reduce acknowledgment traffic for received I-frames.   |
| <i>Transmit window size (Tw)</i>     | Indicates the maximum number of I-frames that can be sent before receiving an RR.  |
| <i>Working transmit size (Ww)</i>    | The maximum number of I-frames that are sent before receiving an RR. This can be less than Tw during the dynamic window algorithm.                               |
| <i>Acks Needed to Inc Ww (Nw)</i>    | Indicates the number of I-frames that the LLC must receive before incrementing Ww by 1.  |
| <i>Current send seq (Vs)</i>         | Send state variable (Ns value for the next I-frame to be transferred).   |
| <i>Current Rcv seq (Vr)</i>          | Receive state variable (next in-sequence Ns to be accepted).   |
| <i>Last ACK'd sent frame (Va)</i>    | Acknowledged state variable (last valid Nr received).  |

|   |  |
|---|--|
| <i>No. of frames in ACK pend q</i>      | Number of transmitted I-frames waiting for acknowledgment.   |
| <i>No. of frames in transmit pend q</i> | Number of frames waiting to be transmitted.  |
| <i>Local Busy</i>                       | The local side of the LLC connection is sending RNRs.  |
| <i>Remote Busy</i>                      | The remote side of the LLC is receiving RNRs.  |
| <i>Poll Retry count</i>                 | Indicates the current value of the retry of the counter (counts down) in the LLC protocol.   |
| <i>Appl output flow stopped</i>         | The LLC told the application to stop sending outgoing data frames.   |
| <i>Send process running</i>             | Runs concurrently with all other frame actions and takes I-frames in the transmit queue and sends them.  |
| <i>Frames - Xmt and Rcvd</i>            | Displays the total number of frame types transmitted (Xmt) and (Rcvd).   |
| <i>I-frames discarded by LLC</i>        | Counter that displays the total number of I-frames discarded by the LLC, usually because the sequence number is out of sequence.                             |
| <i>I-frames refused by LLC user</i>     | Counter that displays the number of I-frames discarded by the software above the LLC. For example, LNM (LAN Network Manager) and DLSw (Data Link Switching). |

## Set

Dynamically configure the LLC parameters on a current LLC session. Any changes that you make to the parameters are effective for the life of session. These parameters are the same as those listed in Chapter 16, “Configuring IEEE 802.5 Token-Ring Network Interfaces.”

**Caution:** Changing LLC parameters from the default can affect how the LLC protocol works.

**Syntax:** set        n2-max\_retry *count*  
                  n3-frames-rcvd-before-ack *count*  
                  nw-acks-to-inc-ww *count*  
                  t1-reply-timer *seconds*  
                  t2-receive-ack-timer *seconds*  
                  ti-inactivity-timer *seconds*  
                  tw-transmit-window *seconds*

#### **n2-max\_retry**

The maximum number of retries by LLC protocol. For example, N2 is the maximum number of times the LLC transmits an RR without receiving an acknowledgment when the inactivity timer expires. Default is 8. Minimum is 1. Maximum is 127.

Example: **set n2-max\_retry**

#### **n3-frames-rcvd-before-ack**

This value is used with the T2 timer to reduce acknowledgment traffic for received I-frames. Set this counter to a specified value. Each time an I-frame is received, this value is decremented. When this counter reaches 0 or the T2 timer expires, an acknowledgment is sent. Default is 1. Minimum is 1. Maximum is 255.

Example: **set n3-frames-rcvd-before-ack**

#### **nw-acks-to-inc-ww**

When the ability to send I-frames is not working, the LLC protocol goes into a mode where the working window (Ww) is set back to 1, and is then slowly increased back to its normal size (Tw). This is known as the dynamic window algorithm. This value is the number of I-frames that the LLC must receive before incrementing Ww by 1. Default is 1. Minimum is 1. Maximum is 127.

Example: **set nw-acks-to-inc-ww**

#### **t1-reply-timer**

This timer expires when the LLC fails to receive a required acknowledgment or response from the other LLC station. When this timer expires, an RR is sent with

the poll bit set and T1 is started again. If the LLC receives no response after the configured maximum number of retries (N2), the link underneath is declared inoperative. Default is 1. Minimum is 1. Maximum is 256.

Example: `set t1-reply-timer`

#### **t2-receive-ack-timer**

This timer is used to delay sending of an acknowledgment for a received I-format frame. This timer is started when an I-frame is received and reset when an acknowledgment is sent. If this timer expires, LLC2 sends an acknowledgment as soon as possible. Set this value so that it is less than that of T1. This ensures that the remote LLC2 peer receives the delayed acknowledgment before the T1 timer expires. Default is 1 (100 ms). Minimum is 1. Maximum is 2560.

Example: `set t2-receive-ack-timer`

**Note:** If this timer is set to 1 (the default), it does not run (for example, `n3-frames-rcvd-before-ack=1`).

#### **ti-inactivity-timer**

Expires when the LLC does not receive a frame for a specified time period. When this timer expires, the LLC transmits an RR until the other LLC responds or the N2 timer expires. Default is 30 seconds. Minimum is 1 second. Maximum is 256 seconds.

Example: `set ti-inactivity-timer`

#### **tw-transmit-window**

Sets the maximum number of I-frames that can be sent before receiving an RR. Assumes that the other end of the LLC session can actually receive this many consecutive I-frames, and that the router has enough heap memory to keep copies of these frames until an acknowledgment is received. Increasing this value may increase the throughput. Default is 2. Minimum is 1. Maximum is 127.

Example: `set tw-transmit-window`

## Exit

Return to the previous prompt level.

**Syntax:** exit

Example: **exit**

## Token-Ring Interfaces and the GWCON Interface Command

While Token-ring interfaces have their own console processes for monitoring purposes, bridging routers also display complete statistics for installed network interfaces when you use the **interface** command from the GWCON environment.

### Statistics Displayed for 802.5 Token-Ring Interfaces

The following statistics display when you enter the **interface** command from the GWCON environment for the Token-ring interfaces.

| Nt | Nt' | Intrfc | No | CSR      | Vec | Self Test |      | Maint | Errors |        |
|----|-----|--------|----|----------|-----|-----------|------|-------|--------|--------|
|    |     |        |    |          |     | Pass      | Fail | Fail  | Input  | Output |
| 2  | 2   | TKR    | 0  | 80002000 | 4C  | 1         | 0    | 0     | 0      | 0      |

Token-Ring /802.5 MAC/data-link on ProNET -4/16 interface

|                        |             |                   |   |
|------------------------|-------------|-------------------|---|
| Physical address       | 000C90820C7 |                   |   |
| Network speed          | 16 MBps     |                   |   |
| Max packet size (INFO) | 2052        |                   |   |
| Handler state          | Ring open   |                   |   |
| Interface Restarts     | 0           |                   |   |
| # times Signal lost    | 0           | # times Beaconing | 0 |
| Hard errors            | 0           | Lobe wire faults  | 0 |
| Auto-removal errors    | 0           | Removes received  | 0 |
| Ring recovery actions  | 0           |                   |   |
| Line errors            | 0           | Burst errors      | 0 |
| ARI/FCI errors         | 0           | Inputs dropped    | 0 |
| Frame copy errors      | 0           | Token errors      | 0 |
| Lost frames            | 0           |                   |   |

The following section describes general interface statistics:

|                     |   |
|---------------------|---|
| <i>Nt</i>           | Global interface number                                     |
| <i>Intrfc</i>       | Interface name  |
| <i>No</i>           | Number of this interface within interfaces of type “intrfc” |
| <i>CSR</i>          | COMM and Status Registers address                           |
| <i>Vec</i>          | Interrupt vector  |
| <i>SlfTst: Pass</i> | Number of times self-test succeeded                         |
| <i>SlfTst: Fail</i> | Number of times self-test failed                            |
| <i>Maint: Fail</i>  | Number of maintenance failures                              |
| <i>Errs: Input</i>  | Number of input errors                                      |
| <i>Errs: Output</i> | Number of output errors                                     |

The following section describes the statistics displayed that are specific to the Token-ring interfaces:

|                               |  |
|-------------------------------|--|
| <i>Physical address</i>       | Specifies the physical address of the token-ring interface.  |
| <i>Network speed</i>          | Specifies the speed of the token-ring network that connects to the interface. The Network Speed counter displays the number of packets that the interface can pass per second.   |
| <i>Max packet size (info)</i> | Displays the maximum packet size configured for that interface. The Max Packet Size counter displays the maximum length, in bytes, of a packet that the interface transmits or receives. This counter is user-defined. |
| <i>Handler state</i>          | Displays the current state of the token-ring handler. The Handler state counter displays the state of the handler after the self-test runs.  |
| <i># of times signal lost</i> | Specifies the total number of times that the router was unable to transmit a packet due to loss of signal.   |

|                              |  |
|------------------------------|--|
| <i>Hard errors</i>           | Displays the number of times the interface transmits or receives beacon frames from the network.   |
| <i>Auto-removal errors</i>   | Displays the number of times the interface, due to the beacon auto-removal process, fails the lobe wrap test and removes itself from the network.  |
| <i>Ring recovery actions</i> | Displays the number of times the interface detects claim token medium access control (MAC) frames on the network.  |
| <i>Line errors</i>           | <p>The Line Errors counter increments when a frame is repeated or copied and the Error Detected Indicator (EDI) is zero for the incoming frame:</p> <p>One of the following conditions must also exist:</p> <ul style="list-style-type: none"> <li>• A token with a code violation exists.</li> <li>• A frame has a code violation between the starting and ending delimiter.</li> </ul> <p>A Frame Check Sequence (FCS) error occurs.</p>   |
| <i>ARI/FCI errors</i>        | <p>The ARI/FCI (Address Recognized Indicator/Frame Copied Indicator) Errors counter increments if the interface receives either of the following:</p> <p>An Active Monitor Present (AMP) MAC frame with the ARI/FCI bits equal to zero and a Standby Monitor Present (SMP) MAC frame with the ARI/FCI bits equal to zero.</p> <p>More than one SMP MAC frame with the ARI/FCI bits equal to zero, without an intervening AMP MAC frame.</p> <p>This error indicates that the upstream neighbor copied the frame but is unable to set the ARI/FCI bits.</p> |



|                          |   |
|--------------------------|---|
| <i>Frame copy errors</i> | Displays the number of times the interface in receive/repeat mode recognizes a frame addressed to its specific address but finds the address recognize indicator (ARI) bits not equal to zero. This error indicates a possible line hit or duplicate address. |
| <i>Lost frames</i>       | Displays the number of times the interface is in transmit mode (stripping) and fails to receive the end of a transmitted frame.   |
| <i># times beaconing</i> | Displays the number of times the interface transmits a beacon frame to the network.   |
| <i>Lobe wire faults</i>  | Displays the number of times the network detects an open or short circuit in the cable between the interface and the wiring concentrator.   |
| <i>Removes received</i>  | Displays the number of times the interface receives a remove ring station MAC frame request and removes itself from the network.  |
| <i>Burst errors</i>      | Displays how many times the interface detects the absence of transitions for five half-bit times between the start delimiter (SDEL) and the end delimiter (EDEL) or between the EDEL and the SDEL.  |
| <i>Inputs dropped</i>    | Displays the number of times an interface in repeat mode recognizes a frame addressed to it but has no buffer space available to copy the frame.  |
| <i>Token errors</i>      | <p>The token errors counter increments when the active monitor detects a token protocol with any of the following errors:</p> <ul style="list-style-type: none"> <li>• The MONITOR_COUNT bit of token with non-zero priority equals one.</li> </ul>           |

- The MONITOR\_COUNT bit of a frame equals one. No token or frame is received within a 10-ms window.
- The starting delimiter/token sequence has a code violation in an area where code violations must not exist.

---

## Configuring the X.25 Network Interface

This chapter describes the X.25 configuration commands.

The X.25 network interface connects a router to an X.25 virtual circuit switched network. The X.25 network interface software and hardware allows the router to communicate over a public X.25 network. The X.25 network interface complies with CCITT 1980 and 1984 specifications for X.25 interfaces offering multiplexed channels and reliable end-to-end data transfer across a wide area network.

### Accessing the Interface Configuration Process

Follow the procedure described in Chapter 1, in the *System Software Guide* to access the interface configuration process for the interface described in this chapter.

**Note:** After you access the interface configuration process, you may begin entering configuration commands. Whenever you make a change to a user-configurable interface parameter, you must restart the router for this change to take effect.

### Basic Configuration Procedures

This section outlines the minimal configuration steps required to get the X.25 interface up and running.

**Note:** You must restart the router for new configuration changes to take effect.

- **Setting the local X.25 address.** You must set the router's local X.25 address using the **set address** command. The X.25 address is a unique X.121 address

that is used during call establishment. Failure to set the network address prevents the X.25 interface from joining the attached network.

- **Setting the data link to X.25.** You must set the data link to X.25 using the **set data-link x25** command.
- **Setting DCE/DTE equipment type.** You must specify whether the frame and packet levels act as DCE or DTE using the **set equipment-type** command. The default for this command is DTE.

**Note:** Keep the following restrictions in mind when defining PVCs and SVCs:

1. The router interface can support any combination of PVCs and SVCs up to a maximum of 239.
  2. The range of defined PVCs *must not* over-lap the defined range of SVCs.
  3. Virtual circuit identifiers can be defined between 1 and 4095.
- **Defining the high and low SVCs.** Define the lower and upper range of the SVCs that you are using. Use the **set svc low** and **set svc high** commands. You can choose from three SVC types: two-way, inbound, and outbound. The default is `svc low-two = 1` and `svc high-two = 64`. All other SVC types default to 0.
  - **Defining PVCs.** If you are using PVCs, you must define the range of PVCs that you are using. Use the **set pvc low** and **set pvc high** commands. The range of PVCs *must not* over-lap the SVC ranges. *Define PVCs.* You must define PVCs individually (for example, `add pvc`).
  - **Adding a protocol.** Add the protocols to run over the X.25 interface: IP, IPX, or DN. Use the **add protocol** command. Note that you only need to add the protocols once for all X.25 networks on router.
  - **Adding a protocol address.** Add an address translation for each protocol's destination address reachable over this interface. Use the **add address** command.

## Addressing

You must assign a unique X.121 network address to each X.25 network interface. Failure to set the network address prevents the X.25 interface from joining the attached network. This address is used during call establishment and also used by the remote DTE for mapping the destination protocol addresses to the X.121 call addresses. The source address of one DTE is the destination for another, thus facilitating the piggybacking of protocol return traffic on previously established circuits. The mapping between the destination protocol address and the destination DTE address is configured using the X.25 configuration **add address** command. (This command is described in more detail later in this chapter). You can assign different protocol destination addresses to a single destination DTE address.

The mapping of the protocol to the X.121 call address is static (SRAM) and is configured on a per protocol and a per network interface basis. The exception is DDN addresses (IP HostTableFormat Addresses), which can also be configured as static permanent entries or dynamically instantiated in parallel to the IP protocol packet send sequence. Dynamic translations of IP HTF addresses to X.121 addresses are not saved over router restarts and are not displayed through the **list** option in the configuration command because they are not saved in SRAM.

The Call User Data (CUD) field is used for IPX to X.25 address mapping only. It determines how the CUD field is filled in when call request packets are received for IPX. The CUD Field can be either Standard or Proprietary. Standard indicates that the usage is protocol multiplexing used in RFC 1356. The default is Standard.

## Setting the X.25 Node Address

Specify an X.25 node address for each interface by entering the X.25 configuration **set address** command.

## Setting the National Personality

Each public data network, such as GTE's Telenet or DDN's Defense Data Network, has its own standard configuration. The term *National Personality* specifies a group of variables used to define a public data network's characteristics. The configuration information in the National Personality provides the router with control information for packets being transferred over the link. The National Personality option defines 28 default parameters for each public data network.

To view the configuration values that are in your X.25 National Personality, execute the X.25 configuration **list detailed** command. Configure each public data network connected to the router by executing the X.25 configuration **set national personality** command.

The National Personality is a generalized template for network configuration. If necessary, you can individually configure each frame and packet layer parameter.

## X.25 Configuration Commands

This section summarizes and explains all the X.25 configuration commands.

Table 18–1 lists the X.25 configuration commands, which allow you to specify network parameters for router interfaces that transmit X.25 packets. The information you specify with the configuration commands activates when you restart the router.

Enter the X.25 configuration commands at the `X.25 config>` prompt.

**Table 18–1 X.25 Configuration Commands Summary**

| <b>Command</b>          | <b>Function</b>   |
|-------------------------|---|
| <b>? (Help)</b>         | Lists the interface configuration commands or lists the options associated with specific commands.  |
| <b>Add</b>              | Adds an address translation, a protocol encapsulation, or a PVC definition.   |
| <b>Change</b>           | Changes an address translation, a protocol encapsulation, or a PVC definition.  |
| <b>Delete</b>           | Removes an address translation, a protocol encapsulation, or a PVC definition.  |
| <b>Disable</b>          | Disables interface-resets, incoming-calls-barred, outgoing-calls-barred feature, or dynamic DDN address translations.   |
| <b>Enable</b>           | Enables interface-resets, incoming-calls-barred, outgoing-calls-barred features, or dynamic DDN address translations.   |
| <b>List</b>             | Lists the defined address translations, National Personality Parameters, protocol encapsulation, or PVC definitions.  |
| <b>National Disable</b> | Disables features defined by the National Personality configuration.  |
| <b>National Enable</b>  | Enables features defined by the National Personality configuration.   |
| <b>National Restore</b> | Restores the National Personality configuration to its default values.  |
| <b>National Set</b>     | Sets parameters defined by the National Personality configuration.  |
| <b>Set</b>              | Sets the local and DDN X.25 node addresses, window size for frame and packet levels, identifies the National personality, and the maximum number of calls out less the PVCs. Defines the PVC and SVC channel ranges, the number of seconds that a switched circuit can be idle before it is cleared, and specifies whether the frame and packet levels act as DCE or DTE. |
| <b>Exit</b>             | Exits the X.25 configuration process.   |

## ? (Help)

List the commands that are available from the current prompt level. You can also enter ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
ADD
CHANGE
DELETE
DISABLE
ENABLE
LIST
NATIONAL-PERSONALITY
SET
EXIT
```

## Add

Add an X.25 address, a DDN X.25 address, a protocol configuration, or a PVC definition.

**Syntax:** add address  
htf-address  
protocol  
pvc

### address

Adds a PDN (Public Data Network) X.25 address translation for a protocol supported in the configuration of the router. The prompts that appear depend on the protocol address that you are adding (see following examples). The protocol address and X.25 address being entered represent the protocol and X.25 address at the remote end of the X.25 link. The **set address** command is used to set the local X.25 address.

Example: **add address**

**IP example:** Protocol [IP]? **IP**  
IP Address [0.0.0.0]?  
X.25 Address []?



**IPX example:** Protocol [IP]? **IPX**  
 CUD Field Usage (Proprietary or Standard) [Standard]?  
 IPX Host Number (in hex) []?  
 X.25 Address []?

**DN example:** Protocol [IP]? **DN**  
 Decnet Address [0.0]?  
 X.25 Address []?

|                        |   |
|------------------------|---|
| <i>Protocol</i>        | Specifies the protocol type of the address mapping you are adding: IP, IPX, or DN. The default is IP.   |
| <i>IP Address</i>      | Specifies the destination's IP address.   |
| <i>IPX Host Number</i> | Specifies the IPX host number of the destination.   |
| <i>CUD Field Usage</i> | This field is for IPX to X.25 address mapping only. It determines how the Call User Data (CUD) field is filled in when call request packets are received for IPX. If an invalid choice is made (that is, something other than Proprietary or Standard), the following error messages appears: <ul style="list-style-type: none"> <li>• Invalid CUD usage type</li> <li>• Standard default will be used</li> </ul> |
| <i>Decnet</i>          | Specifies the area and node of the DECnet address that you want to add.   |
| <i>X.25 Address</i>    | Specifies the PDN interface's X.25 address that connects to the router. The maximum address length is 15 digits.  |

### htf-address

Adds a DDN (Defense Data Network) X.25 address translation.

Example: **add htf-address**

```
Protocol [IP]
Current HTF address
```

|                            |  |
|----------------------------|--|
| <i>Protocol</i>            | Specifies the protocol that you are running over the X.25 interface. DDN supports IP only.   |
| <i>Current HTF address</i> | Specifies the destination PDN address in Host Table Format (HTF) format. Also refer to <code>ddn-address-translations</code> in the Enable/Disable commands section. |

## protocol

Enables a protocol encapsulation and defines associated parameters.

Example: `add protocol`

```
Protocol [IP]
Window Size [2]
Default Packet Size [128]
Maximum Packet Size [256]
Circuit Idle Time [30]
Maximum SVCs [6]
```

|                            |   |
|----------------------------|---|
| <i>Protocol</i>            | Specifies which protocol's encapsulation parameters you want to add: IP, IPX, or DN. The default is IP.   |
| <i>Window Size</i>         | Specifies the number of packets that can be outstanding before an adjacent circuit is established to the same destination. The default is 2.  |
| <i>Default Packet Size</i> | Specifies the default requested packet size for SVCs. This value must be equal to or less than the maximum packet sized specified with the <b>national set packet-size</b> command. The default value is 128 bytes. |
| <i>Maximum Packet Size</i> | Specifies the maximum negotiated packet size for SVCs. This value must be equal to or less than the maximum packet sized specified with the <b>national set packet-size</b> command. The default is 256.            |
| <i>Circuit Idle Time</i>   | Specifies the number of seconds that an SVC can be idle before it is cleared. The range is 0 to 65365. The default is 30 seconds. A 0 (zero) specifies that the circuit is never cleared.                           |

|                          |   |
|--------------------------|---|
| <i>Circuit Idle Time</i> | Specifies the number of seconds that an SVC can be idle before it is cleared. The range is 0 to 65365. The default is 30 seconds. A 0 (zero) specifies that the circuit is never cleared.   |
| <i>Maximum SVCs</i>      | Specifies the maximum number of SVCs that are open to a given destination for a protocol. Use this parameter where parallel paths can result in misordering of forwarder packets. Setting this parameter to the proper number helps to eliminate this problem (at the cost of lower bandwidth). The default is 6. |

## **pvc**

Adds a PVC definition. The prompts that appear depend on the protocol that you are adding the PVC.

Example: **add pvc**

**IP example:** Protocol [IP]? **IP**  
 Packet Channel [1]?  
 Destination X.25 Address[]?  
 Window Size [2]?  
 Packet Size [128]?

**IPX example:** Protocol [IP]? **IPX**  
 Packet Channel [1]?  
 Destination X.25 Address [ ]?  
 Window Size [2]?  
 Packet Size [128]?

|                                 |   |
|---------------------------------|---|
| <i>Protocol</i>                 | Specifies which protocol's encapsulation parameters you want to modify: IP or IPX. The default is IP. |
| <i>Packet Channel</i>           | Specifies the circuit number of the PVC.  |
| <i>Destination X.25 Address</i> | Specifies the address of the PVCs destination.  |

|                    |   |
|--------------------|---|
| <i>Window Size</i> | Specifies the number of packets that can be outstanding before an acknowledgment is sent. The default is 2.   |
| <i>Packet Size</i> | Specifies the number of bytes in the data portion of the packet. The default packet size is 128 bytes. This value must be equal to or less than the maximum set by the <b>national set packet-size</b> command. |

## Change

Modify a PDN X.25 address, DDN X.25 address, protocol configuration, or a PVC definition.

**Syntax:**    change   address  
                   htf address  
                   protocol  
                   pvc

### address

Modifies a PDN X.25 address translation. The prompts that appear depend on the protocol that are changing.

Example: **change address**

**IP example:**    Protocol [IP]? **IP**  
                   IP Address [0.0.0.0]?  
                   X.25 Address [00000124040000]?

**IPX example:** Protocol [IP]? **IPX**  
 CUD Field Usage (Proprietary or Standard) [Standard]?  
 IPX Host number (in hex) []?  
 X.25 Address [00000124040000]?

**DN example:** Protocol [IP]? **DN**  
 Decnet Address [0.0]?  
 X.25 Address [00000124040000]?

|                        |  |
|------------------------|--|
| <i>Protocol</i>        | Specifies the protocol type of the address mapping you want to change: IP, IPX, or DN. The default is IP.  |
| <i>IP address</i>      | Specifies the destination protocol interface's IP address.   |
| <i>CUD Field Usage</i> | This field is for IPX to X.25 address mapping only. It determines how the Call User Data field is filled in when call request packets are received for IPX. If an invalid choice is made (that is, something other than Proprietary or Standard), the following error messages appear: <ul style="list-style-type: none"> <li>• Invalid CUD usage type</li> <li>• Standard default will be used</li> </ul> |
| <i>X.25 address</i>    | Specifies the destination's new PDN X.25 address. The default is current PDN X.25 address.   |
| <i>Decnet</i>          | Specifies the area and node of the DECnet address that you want to change.   |
| <i>IPX Host number</i> | Specifies the IPX host number that you want to change. The default is current host number.   |

#### **htf address**

Changes a DDN X.25 address translation.

Example: **change htf-address**

```
Protocol [IP]
Change HTF address [0.0.0.0]?
New HTF address [10.4.0.124]?
```

|                           |  |
|---------------------------|--|
| <i>Protocol</i>           | Specifies the protocol that you are running over the X.25 interface. DDN supports IP only. |
| <i>Change HTF address</i> | You must specify the current Host Table Format (HTF) address that you want to change.      |
| <i>New HTF address</i>    | Specify the new HFT address. The default is current HFT address.                           |

## **protocol**

Changes a protocol configuration definition.

Example: **change protocol**

```

Protocol [IP]
Window Size [2]
Default Packet Size [128]
Maximum Packet Size [256]
Circuit Idle Time [30]
Maximum VCs [6]

```

|                            |  |
|----------------------------|--|
| <i>Protocol</i>            | Specifies which protocol's encapsulation parameters you want to change: IP, IPX, or DN. The default is IP.   |
| <i>Window Size</i>         | Specifies the number of packets that can be outstanding before an adjacent circuit is established to the same destination. The default is the currently defined window size.   |
| <i>Default Packet Size</i> | Specifies the default requested packet size for SVCs. This value must be equal to or less than the maximum packet sized specified with the <b>national set packet-size</b> command. The default is the previous value. |

|                            |  |
|----------------------------|--|
| <i>Maximum Packet Size</i> | Specifies the maximum negotiated packet size for SVCs. This value must be equal to or less than the maximum packet sized specified with the <b>national set packet-size</b> command. The default is the previous value.  |
| <i>Circuit Idle Time</i>   | Specifies the number of seconds that a circuit can be idle before it is cleared. The range is 0 (zero) to 65365. The default is the currently defined circuit idle time in seconds. A 0 specifies that the circuit is never cleared.   |
| <i>Maximum SVCs</i>        | Specifies the maximum number of SVCs that are open to a given destination for a protocol. This parameter can be used where parallel paths can result in misordering of forwarder packets. Setting this parameter to the proper number helps to eliminate this problem (at the cost of lower bandwidth). The default is the previous value. |

## **pvc**

Changes a PVC definition. The prompts that appear, depend on the protocol's PVC that you are changing.

Example: **change pvc**

**IP example:** Protocol [IP]? **IP**  
 Packet Channel [1]?  
 Destination X.25 Address[]?  
 Window Size [2]?  
 Packet Size [128]?

**IPX example:** Protocol [IP]? **IPX**  
 Packet Channel [1]?  
 Destination X.25 Address []?  
 Window Size [2]?  
 Packet Size [128]?

|                                 |   |
|---------------------------------|---|
| <i>Protocol</i>                 | Specifies which protocol's encapsulation parameters you want to change: IP or IPX. The default is IP.   |
| <i>Packet Channel</i>           | Specifies the circuit number of the PVC. The default is currently defined circuit number.   |
| <i>Destination X.25 Address</i> | Specifies the address of the PVCs destination. The default is currently defined X.25 address.   |
| <i>Window Size</i>              | Specifies the number of packets that can be outstanding before an acknowledgment is sent. The default is the currently defined window size.   |
| <i>Packet Size</i>              | Specifies the number of bytes in the data portion of the packet. The default packet size is 128 bytes. This value must be equal to or less than the maximum set by the <b>national set packet-size</b> command. The default is the currently defined packet size. |

## Delete

Delete a X.25 address, a protocol configuration definition, or a PVC definition.

**Syntax:**    delete    address  
                                   protocol . . .  
                                   pvc

### address

Deletes an X.25 address translation.

Example: **delete address**

**IP example:**    Protocol [IP]?  
                   IP Address [0.0.0.0]?

**IPX example:**   Protocol [IP]?  
                   IPX Host Number (in hex) [2]?



|                        |   |
|------------------------|---|
| <i>Protocol</i>        | Specifies the protocol type of the address mapping you are deleting. The default is IP. |
| <i>IP Address</i>      | Specifies the destination protocol interface's IP address.                              |
| <i>IPX Host Number</i> | Specifies the IPX host number.  |

### **protocol *prot-type***

Deletes a protocol encapsulation configuration definition. *Prot-type* is the name or number of the protocol encapsulation that is currently defined in the router's configuration.

Example: **delete protocol IPX**

### **pvc**

Deletes a PVC definition.

Example: **delete pvc**

```
Protocol [IP]?
Destination X.25 Address []?
```

|                                 |  |
|---------------------------------|--|
| <i>Protocol</i>                 | Specifies the protocol that you are running over the X.25 interface. DDN supports IP only. |
| <i>Destination X.25 Address</i> | Specifies the address of the PVCs destination.   |

## Disable

Disable DDN address translations, interface resets as part of network certification, or the incoming-calls-barred or the outgoing-calls-barred features.

**Syntax:**    disable    ddn-address-translations  
                  interface-resets  
                  incoming-calls-barred  
                  outgoing-calls-barred

### **ddn-address-translations**

Specifies that the DDN host table format (IP) addresses are not dynamically converted to X.121 call addresses.

Example: `disable ddn-address-translations`

### **interface-resets**

Specifies that both the packet layer restarts and frame layer link establishment is initiated by the network interface. This feature is used during certification testing to enable the network to control packet and frame layer restarts.

Example: `disable interface resets`

### **incoming-calls-barred**

Specifies that the router accepts incoming calls.

Example: `disable incoming-calls-barred`

### **outgoing-calls-barred**

Specifies that the router allows outgoing calls.

Example: `disable outgoing-calls-barred`

## Enable

Enable DDN address translations, interface resets, or to enable the incoming-calls-barred or the outgoing-calls-barred features.

**Syntax:**    enable    ddn-address-translations  
                  interface-resets  
                  incoming-calls-barred  
                  outgoing-calls-barred

### ddn-address-translations

Specifies that the DDN host table format (IP) addresses are dynamically converted to X.121 call addresses. The default is Disabled.

Example: `enable ddn-address-translations`

### interface-resets

Specifies that both the packet layer restarts and the frame layer link establishment can be initiated by either the router or the network interface. This feature is used during normal operation. The default is Enable.

Example: `enable interface-resets`

### incoming-calls-barred

Specifies that the router does not accept incoming calls. The default is Enable.

Example: `enable incoming-calls-barred`

### outgoing-calls-barred

Specifies that the router does not allow outgoing calls. The default is Enable.

Example: `enable outgoing-calls-barred`

## List

Display the current configuration for the specified parameter.

**Syntax:** `list` addresses  
all  
detailed  
protocols  
pvc  
summary

### addresses

Lists all the X.25 address translations.

Example: `list addresses`

X.25 address translation configuration

| IF# | Prot # | Protocol | X.25 address               |
|-----|--------|----------|----------------------------|
| 1   | 0      | 10.1.2.3 | 1238765742                 |
| 1   | 4      | 1.10     | 9910                       |
| 1   | 7      | 10       | 12389 CUD Field = Standard |

*IF#* Displays the current interface number. You accessed this at the `Config>` prompt using the `net <number>` command. All addresses listed belong to this network.

*Prot#* Displays the identification of the protocol that this mapping is defined.

*Protocol* Displays the destination address of the protocol.

*X.25 address* Displays the protocol X.25 address corresponding to that protocol address.

*CUD Field* This field is for IPX to X.25 address mapping only. It determines how the Call User Data field is filled in when call request packets are received for IPX. The CUD Field can be either Standard or Proprietary. Standard indicates that the usage is the protocol identification specified in RFC 1356. The default is Standard.

**all**

Lists all the X.25 addresses, National Personality parameters, all defined protocols and their values, and all defined PVC's.

Example: **list all**

```
X.25 Configuration Summary
Node Address: 23785763
Max Calls Out: 15          Inter-Frame Delay: 0
Default Window: 4         SVC idle: 25 seconds
National Personality: GTE Telenet (DTE)
PVC          low: 1 high: 2
Inbound     low: 0 high: 0
Two-Way     low: 5 high: 64
Outbound    low: 0 high: 0
Throughput Class in bps Inbound: 2400
Throughput Class in bps Outbound: 2400

X.25 National Personality Configuration
Follow CCITT: on      OSI 1984: on      OSI 1988: off
Clear w/diag: on    Reset w/diag: on    Restart w/diag: on
Request Reverse Charges: on  Accept Reverse Charges: on
Allow Packet Restarts: on  Suppress Calling Addresses: off
Suppress Cause Fields: on  Suppress Frame Idle RRs: off
Frame Extended seq mode: off Packet Extended seq mode: off
Use Multi-link Addresses: off Disable Interface Resets: off
Incoming Calls Barred: off Outgoing Calls Barred: off
Throughput Negotiation: on  Flow Control Negotiation: on
DDN Address Translation off

Call Request Timer: 20 decaseconds
Clear Request Timer: 18 decaseconds (1 retries)
Reset Request Timer: 18 decaseconds (1 retries)
Restart Request Timer: 18 decaseconds (1 retries)
T1 Timer: 4 seconds  N2 timeouts: 20
T2 Timer: 2 seconds  DP Timer: 500 milliseconds
Standard Version: 1984 Network Type: CCITT
Disconnect Procedure: passive
Window Size Frame: 7 Packet: 2
Packet Size Default: 128 Maximum: 256
X.25 protocol configuration
Prot Window Packet-size Idle
Number Size Default Maximum Time
0 7 128 256 30

X.25 PVC configuration
Prtcl X.25_address Window Pkt_len L3_chan
0 21309001122330 7 128 1

X.25 address translation configuration
IF # Prot # Protocol -> X.25 address
4 0 128.185.184.26 -> 21309001122330
4 0 128.185.184.21 -> 21309445566770
```

## detailed

Lists the value of all the default parameters that the **national set** command modifies. Descriptions of the screen display are listed in the **national set** command described later in this chapter.

Example: **list detailed**

```
X.25 National Personality Configuration

Follow CCITT: on          OSI 1984: on   OSI 1988: off
Clear w/diag: on        Reset w/diag: on   Restart w/diag: on
Request Reverse Charges: on  Accept Reverse Charges: on
Allow Packet Restarts: on  Suppress Calling Addresses: off
Suppress Cause Fields: on  Suppress Frame Idle RRs: off
FrameExtended seq mode: off PacketExtended seq mode: off
UseMulti-linkAddresses: off Disable Interface Resets: off
Incoming Calls Barred: off  Outgoing Calls Barred: off
Throughput Negotiation: on  Flow Control Negotiation: on
DDN Address Translation: off
Call Request Timer:      20 decaseconds
Clear Request Timer:    18 decaseconds (1 retries)
Reset Request Timer:    18 decaseconds (1 retries)
Restart Request Timer:  18 decaseconds (1 retries)
T1 Timer: 4 seconds      N2 timeouts: 20
T2 Timer: 2 seconds      DP Timer: 500 milliseconds
Standard Version: 1984    Network Type: CCITT
Disconnect Procedure: passive
Window Size  Frame: 7    Packet: 2
Packet Size  Default: 128 Maximum: 256
```

## protocols

Lists all the defined protocol configurations.

Example: **list protocols**

```
X.25 protocol configuration

Protocol      Window      Packet-Size      Idle      Max
Number        Size        Default Maximum  Time      VCs
-----
0             4           128 256          10        6
5             2           128 256          30        6
```

|                        |   |
|------------------------|---|
| <i>Protocol Number</i> | Displays the protocol's encapsulation parameters for that protocol: IP, IPX, or DN.   |
| <i>Window Size</i>     | Displays the number of packets that can be outstanding before an acknowledgment is sent.  |
| <i>Packet-Size</i>     | Displays the default and maximum packet sizes that are configured for the router.   |
| <i>Idle Time</i>       | Displays the number seconds that a circuit can be idle before it is cleared. The range is 0 (zero) to 65365. A 0 specifies that the circuit is never cleared. |
| <i>Maximum VCs</i>     | Displays the maximum number of VCs that are open to a given destination for a protocol.   |

## **pvc**

Lists all the defined PVCs.

Example: `list pvc`

```

X.25 PVC configuration
Prtcl   X.25 Address   Window   Pkt_len   Pkt_chan
0       8383838383     4        1024      3

```

|                     |  |
|---------------------|--|
| <i>Prtcl</i>        | Displays the identifier of the protocol running over this PVC, IP, IPX, or DN. |
| <i>X.25 Address</i> | Displays the destination X.25 address.   |
| <i>Window</i>       | Displays the window size of the PVC.   |
| <i>Pkt_len</i>      | Displays the maximum length of a packet transmitted over the PVC.              |
| <i>Pkt_chan</i>     | Displays the circuit number of the PVC.  |

## **summary**

Lists all the values established by the **set** and **enable** commands. These values modify the X.25 configuration.

Example: `list summary`

## Serial Output

### X.25 Configuration Summary

```
Node Address: 23785763
Max Calls Out: 15          Inter-Frame Delay: 1
Default Window: 4         SVC idle: 25 seconds
National Personality: GTE Telenet (DTE)
PVC          low: 1  high: 2
Inbound      low: 0  high: 0
Two-Way      low: 3  high: 64
Outbound     low: 0  high: 0
Throughput Class in bps Inbound: 2400
Throughput Class in bps Outbound: 2400
```

|                             |  |
|-----------------------------|--|
| <i>Node Address</i>         | Displays the local X.25 interface address ( <i>x.25-node-addr</i> ).   |
| <i>Max Calls Out</i>        | Displays the default maximum number of SVC's initiated by the router to a given destination for a given protocol. The range is 0 to 227.   |
| <i>Inter-Frame Delay</i>    | Displays the minimum number of flags set to be transmitted between frames.   |
| <i>Default Window</i>       | Displays the window size assumed for the packet layer. The range is determined by the National Personality packet-extended-sequence-mode. In the absence of any facilities in the SVC call setup, this is the assured value. |
| <i>SVC idle</i>             | Displays the number of seconds that a switched circuit can be idle before it is cleared. The range is 1 to 255.  |
| <i>Max-retries</i>          | Displays the maximum number of reset request transmissions permitted before the call is cleared.   |
| <i>National Personality</i> | Displays the <i>GTE-Telenet</i> or <i>DDN</i> National Personality. <i>GTE-Telenet</i> is the default setting.   |
| <i>PVC (low, high)</i>      | Displays the lowest to the highest permanent virtual circuit channel numbers. Zero indicates no PVCs. The range is 0 through 4095.   |



|  |  |
|--|--|
| <i>Inbound (low, high)</i>                         | Displays the lowest to the highest inbound switched virtual circuit channel numbers. The default setting is 0; therefore, by default, there are no inbound-only SVCs. The range is 0 through 4095.                                   |
| <i>Two-way (low, high)</i>                         | Displays the lowest to the highest 2-way switched virtual circuit channel numbers. The default setting is 1 for the low parameter and 64 for the high parameter. By default, there are 64 two-way SVCs. The range is 0 through 4095. |
| <i>Outbound (low, high)</i>                        | Displays the lowest to the highest outbound switched virtual circuit channel numbers. The default setting is 0; therefore, by default, there are no outbound-only SVCs. The range is 0 through 4095.                                 |
| <i>Throughput Class in bps (inbound, outbound)</i> | Displays default throughput capacity (in bits per second) for inbound and outbound traffic.  |

## National Disable

Disable a feature defined by the National Personality configuration.

**Syntax:** national disable acept-reverse-charges  
ccitt  
clear-w/diag  
flow-control-negotiation  
frame-ext-seq-mode  
multi-link-addresses  
osi-84  
osi-88  
packet-ext-seq-mode  
packet-layer-restarts  
request-reverse-charges  
reset-w/diag  
restart-w/diag  
suppress-calling-addresses

suppress-idle-frame-rr  
suppress-non-zero-cause  
throughput-class-negotiation

#### **accept-reverse-charges**

Disables the accepting of reverse charges for calls during call establishment. This option is not available for DDN.

Example: `national disable accept-reverse-charges`

#### **ccitt**

Disables the use of the CCITT convention, rather than ISO convention, that is followed for timer retry expiration. CCITT acts as if the confirmation packet for the restart or clear requests had arrived. ISO leaves the request unconfirmed.

Example: `national disable ccitt`

#### **clear-w/diag**

Does not allow the clear request packets to include the diagnostic field.

Example: `national disable clear-w/diag`

#### **flow-control-negotiation**

Disables negotiation of packet and window size during call setup of SVCs.

Example: `national disable flow-control-negotiation`

#### **frame-ext-seq-mode**

Disables the frame layer from using extended sequence numbers 0 to 127. Sets the frame layer sequence numbering to 0 to 7.

Example: `national disable frame-ext-seq-mode`

#### **multi-link-addresses**

Sets the frame level addresses back to A (03) and B (01).

Example: `national disable multi-link-addresses`

**osi-84**

Disables CCITT OSI facilities as defined by the 1984 standard.

Example: `national disable osi-84`

**osi-88**

Disables CCITT OSI facilities as defined by the 1988 standard.

Example: `national disable osi-88`

**packet-ext-seq-mode**

Disables the packet layer from using extended sequence numbers 0 to 127. Sets the packet layer sequence numbering to 0 to 7.

Example: `national disable packet-ext-seq-mode`

**packet-layer-restarts**

Disables the packet layer from sending a start packet when the router restarts. The default for this feature is ON. Disable this feature only if the switch you connecting to requires that this be disabled.

**Note:** If this feature is disabled on both sides of the line, the line does not come up. If this feature is disabled on one side of the line, the line still comes up.

Example: `national disable packet-layer-restarts`

**request-reverse-charges**

Disables the requesting of reverse charges for all outgoing calls.

Example: `national disable request-reverse-charges`

**reset-w/diag**

Disables the inclusion of diagnostic fields in restart request packets.

Example: `national disable reset-w/diag`

**restart-w/diag**

Disables the inclusion of diagnostic fields in restart request packets.

Example: `national disable restart-w/diag`

**suppress-calling-addresses**

Disables the suppression of the source address in call packets.

Example: `national disable suppress-calling-addresses`

**suppress-idle-frame-rr**

Enables the sending of idle receiver ready frame layer frames.

Example: `national disable suppress-idle-frame-rr`

**suppress-non-zero-cause**

Disables the inclusion of non-zero values in the packet layer's cause fields.

Example: `national disable suppress-non-zero-cause`

**throughput-class-negotiation**

Disables the negotiation of through-put class during call setup of SVCs

Example: `national disable throughput-class-negotiation`

## National Enable

Enable a feature defined in the National Personality configuration.

**Syntax:**    national   enable   acept-reverse-charges  
  ccitt  
  clear-w/diag  
  flow-control-negotiation  
  frame-ext-seq-mode  
  multi-link-addresses  
  osi-84  
  osi-88  
  packet-ext-seq-mode  
  packet-layer-restarts  
  request-reverse-charges  
  reset-w/diag  
  restart-w/diag  
  suppress-calling-addresses  
  suppress-idle-frame-rr  
  suppress-non-zero-cause  
  throughput-class-negotiation  
  \_

### **accept-reverse-charges**

Accepts reverse charge calls during call establishment. This option is not available for DDN.

Example: `national enable accept-reverse-charges`

### **ccitt**

Specifies that the CCITT convention, rather than ISO convention, is followed for timer retry expiration. CCITT acts as if the confirmation packet for the restart or clear requests had arrived. ISO leaves the request unconfirmed.

Example: `national enable ccitt`

### **clear-w/diag**

Allows clear request packets to include the diagnostic field.

Example: `national enable clear-w/diag`

**flow-control-negotiation**

Enables the negotiation of packet and window size during call setup of SVCs.

Example: `national enable flow-control-negotiation`

**frame-ext-seq-mode**

Sets the frame layer sequence numbering to modulus 128 (that is, 0 through 127).

Example: `national enable frame-ext-seq-mode`

**multi-link-addresses**

Allows the frame level to use addresses C (0F) and D (07) rather than A (03) and B (01).

Example: `national enable multi-link-addresses`

**osi-84**

Allows CCITT OSI facilities defined by the 1984 standard.

Example: `national enable osi-84`

**osi-88**

Allows CCITT OSI facilities defined by the 1988 standard.

Example: `national enable osi-88`

**packet-ext-seq-mode**

Sets the packet layer sequence numbering modulus 128 (that is, 0 through 127).

Example: `national enable packet-ext-seq-mode`

**packet-layer-restarts**

Specifies that the packet layer sends a restart packet when the router restarts.

Example: `national enable packet-layer-restarts`

**request-reverse-charges**

Requests reverse charges for all outgoing calls.

Example: `national enable request-reverse-charges`

**reset-w/diag**

Allows reset request packets to include the diagnostic field.

Example: `national enable reset-w/diag`

**restart-w/diag**

Allows restart request packets to include the diagnostic field.

Example: `national enable restart-w/diag`

**suppress-calling-address**

Suppresses the source address in call packets.

Example: `national enable suppresses-calling-addresses`

**suppress-idle-frame-rr**

Suppresses the sending of idle receiver ready frame layer frames.

Example: `national enable suppress-idle-frame-rr`

**suppress-non-zero-cause**

Suppresses packet layer's cause fields.

Example: `national enable suppress-non-zero-cause`

**throughput-class-negotiation**

Enables the registration of throughput class.

Example: `national enable throughput-class-negotiation`

## National Restore

Restore one or all of the default values made to the National Personality configuration with the **national set** command, the **national enable** command, or **national disable** command.

**Syntax:**    national   restore   all  
                  accept-reverse-charges  
                  call-req  
                  ccitt  
                  clear-req . . .  
                  clear-w/diag  
                  disconnect-procedure . . .  
                  dp-timer  
                  flow-control-negotiation  
                  frame-ext-seq-mode  
                  frame-window-size  
                  multi-link-addresses  
                  network-type . . .  
                  n2-timeouts  
                  osi-84  
                  osi-88  
                  packet-size . . .  
                  packet-ext-seq-mode  
                  packet-layer-restarts  
                  request-reverse-charges  
                  reset . . .  
                  reset-w/diag  
                  restart . . .  
                  standard-version  
                  suppress-calling-addresses  
                  suppress-idle-frame-rr  
                  suppress-non-zero-cause  
                  throughput-class-negotiation  
                  t1-timer  
                  t2-timer



**all**

Restores all the default values to the National Personality configuration.

Example: `national restore all`

**accept-reverse-charges**

Restores the accept-reverse-charges feature for calls during call establishment. This option is not available for DDN.

Example: `national restore accept-reverse-charges`

**call-req**

Resets the number of ten second intervals permitted before clearing an unaccepted call to the national default.

Example: `national restore call-req`

**ccitt**

Restores the feature that specifies that the CCITT convention, rather than ISO convention, is followed for timer retry expiration. CCITT acts as if the confirmation packet for the restart or clear requests had arrived. ISO leaves the request unconfirmed.

Example: `national restore ccitt`

**clear-req *retries timer***

Resets the number of clear request transmissions (*retries*) and the number of ten second intervals (*timer*) to wait before retransmitting to the national default.

**clear-w/diag**

Restores the feature that allows clear request packets to include the diagnostic field.

Example: `national restore clear-w/diag`

**disconnect-procedure** *passive active*

Specifies the type of disconnect procedure to use when disconnecting.

Example: `national restore disconnect-procedure`

*Passive* Specifies that there are no DISC frames used when disconnecting.

*Active* Specifies that there are DISC frames used when disconnecting.

**dp-timer**

Specifies the number of milliseconds that the frame level remains in a disconnected state. Zero indicates immediate transition from disconnected phase to link setup state.

Example: `national restore DP-timer`

**flow-control-negotiation**

Restores the feature that determines the frame's packet size and window size; suitable for call set-up negotiation.

Example: `national restore flow-control-negotiation`

**frame-ext-seq-mode**

Restores the frame layer sequence numbering modulus.

Example: `national restore frame-ext-seq-mode`

**frame-window-size**

Restores the default number of frames.

Example: `national restore frame-window-size`

**multi-link-addresses**

Restores the default value for frame layer addressing.

Example: `national restore multi-link-addresses`

### **network-type *CCITT DDN***

Specifies the network convention.

Example: `national restore network-type`

*CCITT* Specifies the CCITT convention.

*DDN* Specifies the DDN convention.

### **n2-timeouts**

Restores the default value for the number of times the T1 timer can expire before a state change.

Example: `national restore N2-timeouts`

### **osi-84**

Restores the default value for CCITT OSI facilities defined by the 1984 standard.

Example: `national restore osi-84`

### **osi-88**

Restores the default value for CCITT OSI facilities defined by the 1988 standard.

Example: `national restore osi-88`

### **packet-size *default OR maximum OR window***

Restores the default value for these packet layer values.

Example: `national restore packet-size default`

*Default* Number of bytes in the data portion of the packet. The value is restored to 128.

*Maximum* Maximum number of bytes in the data portion of the packet. The value is restored to 256.

*Window* Number of outstanding I-frames permitted before acknowledgement is required. The value is restored to 2.

### **packet-ext-seq-mode**

Restores the default value for the packet layer sequence numbering.

Example: `national restore packet-seq-mode`

### **packet-layer-restarts**

Restores the default value for packet layer sending of restart packet when the router restarts.

Example: `national restore packet-layer-restarts`

### **request-reverse-charges**

Restores the default value for reverse charges request for all outgoing calls.

Example: `national restore request-reverse-charges`

### **reset *retries timer***

Restores the default value for the number of reset retransmissions.

Example: `national restore reset`

*Retries*                      Number of reset request transmissions permitted before the call is cleared. The range is 0 to 255.

*Timer*                        Number of ten second intervals to wait before retransmitting a reset request packet. The range is 0 – 255. A zero in the *timer* value indicates an indefinite wait.

### **reset-w/diag**

Restores the default feature that allows the a reset request packet to include the diagnostic field.

Example: `national restore reset-w/diag`

**restart-retries**

Restores the default value for the number of restart request retransmissions.

Example: `national restore restart retries`

**restart-timer**

Restores the timeout value for the number of restart request transmissions.

Example: `national restore restart timer`

**standard-version**

Restores default OSI facilities settings.

Example: `national restore standard-version`

**suppress-calling-address**

Restores the default value for this national personality and determines whether to enable the suppression of the source address in call packets. The default is disabled.

Example: `national restore suppress-calling-address`

**suppress-idle-frame-rr**

Restores the default value for this national personality and determines whether to suppress the sending idle receiver ready frame layer frames. The default is disabled.

Example: `national restore suppress-idle-frame-rr`

**suppress-non-zero-cause**

Restores the default value for this national personality and determines whether to suppress of the packet layer's cause fields. The default is disabled.

Example: `national restore suppress-non-zero-cause`

### throughput-class-negotiation

Restores the default state (enable/disabled) determined by personality whether to negotiate the throughput class on SVC setup. The default is enable.

Example: `national restore throughput-class-negotiation`

### t1-timer

Restores the default value for the frame retransmit time in seconds.

Example: `national restore T1-timer`

### t2-timer

Restores the default value for the maximum number of seconds to wait before sending an I-frame received acknowledgement. This is an optimization parameter. If this value is non-zero, the router defers acknowledging received I-Frames. In this case, it expects to transmit an I-Frame that performs this acknowledgment. It can improve link utilization. It results in T2 timeouts.

Example: `national restore T2-timer`

## National Set

Set one or all of the default values made to the National Personality configuration.

**Syntax:**    national set            call-req  
  clear-req . . .  
  disconnect-procedure . . .  
  dp-timer  
  frame-window-size  
  network-type . . .  
  n2-timeouts  
  packet-size . . .  
  reset . . .  
  restart . . .

standard-version

t1-timer

t2-timer

### **call-req**

Specifies the number of ten second intervals permitted before giving up on a call request and clearing it. A zero indicates an indefinite wait.

Example: `national set call-req`

### **clear-req *retries timer***

Specifies the number of clear request retransmissions.

*Retries*                      Number of clear request transmissions permitted before action is taken.

*Timer*                         Number of ten second intervals to wait before retransmitting a call request packet. A zero in the *timer* value indicates an indefinite wait.

Example: `national set clear-req`

### **disconnect-procedure *passive active***

Specifies the type of disconnect procedure to use when disconnecting.

Example: `national set disconnect-procedure active`

*Passive*                        Specifies that DISC frames not are used when disconnecting.

*Active*                         Specifies that DISC frames are used when disconnecting.

### **dp-timer**

Specifies the number of milliseconds that the frame level remains in a disconnected state. Zero indicates immediate transition from disconnected phase to link setup state.

Example: `national set dp-timer`

### **frame-window-size**

Specifies the number of frames that can be outstanding before acknowledgement.

Example: `national set frame-window-size`

### **network-type *CCITT DDN***

Specifies the type of network being supported.

Example: `national set network-type`

*CCITT* Specifies the CCITT convention.

*DDN* Specifies the DDN convention.

### **n2-timeouts**

Specifies the number of times the T1 timer can expire before a state change.

Example: `national set n2-timeouts`

### **packet-size *default-size max-size window-size***

Specifies the size of the packet.

Example: `national set packet-size`

*Default-size* Number of bytes in the data portion of the packet. Possible options include 128, 256, 512, 1024, 2048, and 4096. This value must be less than or equal to the maximum size. This value is used when and if flow control negotiation is enabled. *Default-size* cannot be greater than *max-size*.

*Max-size* Maximum number of bytes in the data portion of the packet. Possible options include 128, 256, 512, 1024, 2048, and 4096.

*Window-size* Number of outstanding I-frames permitted before acknowledgement is required. The range is 1 to 7. When extended sequence numbers are in use, the range is 1 to 127. This value is used when and if flow control negotiation is enabled.



**reset *retries timer***

Specifies the number of reset request retransmissions.

Example: `national set reset`

**restart *retries timer***

Specifies the number of restart request transmissions.

Example: `national set restart`

|                |  |
|----------------|--|
| <i>Retries</i> | Number of reset request transmissions permitted before the call is cleared. The range is 0 to 255.   |
| <i>Timer</i>   | Number of ten second intervals to wait before retransmitting a restart request packet. The range is 0 to 255. A zero in the <i>timer</i> value indicates an indefinite wait. |

**standard-version**

Determines some of the default settings. Options are 1980, 1984, and 1988.

Example: `national set standard-version`

**t1-timer**

Specifies the frame retransmit time in seconds.

Example: `national set t1-timer`

**t2-timer**

Specifies the number of seconds to wait pending I-frame acknowledge.

Example: `national set t2-timer`

## Set

Configure local X.25 node addresses, maximum number of calls, frame and packet level window size, lowest to highest PVC and SVC channels, and the idle time for a switched circuit.

**Syntax:**    set        address . . .  
                  calls-out . . .  
                  default-window-size . . .  
                  equipment-type . . .  
                  htf addr . . .  
                  inter-frame-delay . . .  
                  max-retry . . .  
                  national-personality . . .  
                  pvc . . .  
                  svc low . . .  
                  svc high . . .  
                  throughput-class . . .  
                  vc idle . . .

### **address** *X.25-node-addr*

Sets the local X.25 interface address (*x.25-node-addr*). Set the X.25 node address to 0, not to 00, to delete the local X.25 address.

Example: **set address 8982800**

### **calls-out** *value*

Sets the maximum number of locally initiated simultaneously active SVCs. The range is 0 to 227. The default is 4.

Example: **set calls-out 3**

**default-window-size *value***

Sets the window size for the packet level assigned by the router if there is no window-size facility in the Call-Request-Packet. The range is determined by the National Personality packet modulus (PACKET-EXT-SEQ-MODE). The default is 2.

Example: `set default-window-size 3`

**equipment-type *DCE DTE***

Specifies whether the frame and packet levels act as *DCE* or *DTE*. *DTE* is the default setting. This has no relation to the cable type in use.

Example: `set equipment-type DCE`

**hft addr *x.25-node-addr***

Sets the local DDN X.25 address translation (*x.25-node-addr*). Set the X.25 node address to 0, not to 00, to delete the local X.25 address.

Example: `set htf-address 11.42.0.137`

**inter-frame-delay *value***

This parameter defines the minimum delay between transmitted frames. Setting this parameter is useful when interfacing directly to older equipment that may not be able to consistently handle consecutive frames separated by one flag resulting in receive errors (for example, T1 timeouts). This parameter functions as follows:

Example: `set inter-frame-delay 1`

**max-retry *value***

Sets the maximum number (*value*) of physical layer retransmissions attempted.

Example: `set max-retry 4`

**national-personality *GTE-Telenet or DDN***

Sets the 28 default parameters for either *GTE-Telenet* or *DDN* National Personality. *GTE-Telenet* is the default setting.

Example: `set national-personality DDN`

### **pvc low/high *value***

Defines the lowest to the highest permanent virtual circuit channel number (*value*). Zero indicates no PVCs. The default for the **PVC low** parameter is 0 and the default for **PVC high** is 0. Therefore, by default there are no PVCs. The range is of 0–4095. These values are setting the boundaries of a given VC range. The values of boundaries can range between 0 and 4095, however, the actual range is limited by memory (for example, if **set PVC low** is set to **1** and **set PVC high** is set to **4095**, these are valid boundary ranges but there is not enough memory to support this range.)

Example: `set PVC low 40`

### **svc low/high *inbound two-way outbound***

Defines the lowest to the highest switched virtual circuit channel number (*value*).

Example: `set SVC low two-way 1`

|                 |  |
|-----------------|--|
| <i>Inbound</i>  | Specifies a range of 1 – 255. The default setting is 0; therefore, by default, there are no inbound only SVCs.   |
| <i>Two-way</i>  | Specifies a range of 1 – 255. The default setting is 1 for the <b>SVC low</b> parameter and 64 for the <b>SVC high</b> parameter. By default, there are 64 2-way SVCs. |
| <i>Outbound</i> | Specifies a range of 1 to 255. The default setting is 0; therefore, by default, there are no outbound only SVCs.   |

### **throughput-class inbound/outbound *bit-rate***

Defines the throughput class requested when making a call request while throughput negotiation is enabled. The default bit-rate setting is 2400 bps.

Example: `set throughput-class inbound`

```
throughput class inbound (2400)?
```

**vc-idle *value***

Defines the number of seconds (*value*) that a switched circuit can be idle before it is cleared. The value is 1 to 255. Zero indicates that the circuit is never cleared. The default is 30 seconds.

Example: `set vc-idle 40`

**Exit**

Return to the `Config>` prompt.

**Syntax:** `exit`

Example: `exit`



---

## Monitoring the X.25 Network Interface

This chapter describes the X.25 console commands.

For more information on X.25, refer to the *Routing Protocols Reference Guide*.

### Accessing the Interface Console Process

Follow the procedure described in the Chapter 1 to access the interface console process for the interface described in this chapter. Once you access the desired interface console process, you may begin entering console commands.

### X.25 Console Commands

This section summarizes and explains all the X.25 console commands. The X.25 console commands allow you to view the parameters and statistics of the interfaces and networks that transmit X.25 packets. Console commands display configuration values for the physical, frame, and packet levels. You also have the option of viewing the values for all three protocol levels at once.

Enter the X.25 console commands at the `x.25>` prompt.

**Table 19–1 X.25 Console Command Summary**

| <b>Console Command</b> | <b>Function</b>   |
|------------------------|---|
| <b>? (Help)</b>        | Lists all the X.25 console commands or lists the options associated with specific commands. |
| <b>List</b>            | Lists individual PVC or SVC statistics and general information.                             |
| <b>Parameters</b>      | Displays the current parameters for any level of the X.25 configuration.                    |
| <b>Statistics</b>      | Displays the current statistics for any level of the X.25 configuration.                    |
| <b>Exit</b>            | Exits the X.25 console process and returns to the GWCON process.                            |

### **? (Help)**

List the commands that are available from the current prompt level. You can also enter a ? after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
List
Parameters
Statistics
Exit
```

### **List**

Display the current active PVCs and SVCs.

**Syntax:** list      pvcs  
                          svcs

#### **pvc**

Displays the configured permanent virtual circuits.

Example: **list pvc**



## **svc**

Displays the active switched virtual circuits.

Example: **list svcs**

| HCN/<br>State | Destination<br>Address | Originate<br>Call | Transmits<br>Queued | Protocol<br>Encapsulated | Totals<br>Xmts Rcvts Resets |      |     |   |
|---------------|------------------------|-------------------|---------------------|--------------------------|-----------------------------|------|-----|---|
| 13            | D                      | 898280077113      | YES                 | 0                        | IP                          | 8943 | 261 |   |
| 1             | 20 D                   | 898280077114      | NO                  | 0                        | IP                          | 943  | 43  |   |
| 0             | 40 D                   | 898280077115      | YES                 | 0                        | DN                          | 567  | 104 |   |
| 0             | 42 P                   | 898280077116      | YES                 | 6                        | IP                          | 0    | 0   |   |
| 0             | 23 C                   | 898280077117      | YES                 | 0                        | IP                          | 3054 | 110 | 0 |

D - Data Transfer      P - Call Progressing  
C - Call Clearing

## **Parameters**

Use the **parameters** command to display the current parameters for any level of the X.25 configuration.

**Syntax:**    parameters      all  
                                  frame  
                                  packet  
                                  physical

### **all**

Displays the parameters for the packet, frame, and physical levels.

Example: **parameters all**

### **frame**

Displays the parameters for the frame level.

**Example: parameters frame**

Frame Layer Parameters:

```
Maximum Frame Size = 262 Maximum Window Size = 7
Protocol Enabled = YES Equipment Type = DTE
T1 Retransmit Timer = 4 T2 Acknowledge Timer = 2
N2 Retry Counter = 20 Disconnect Procedure = PASSIVE
Disconnect Timer = 500 Network Type = GTE

Protocol Options: Inhibit Idle RRs NO MOD 128 NO
                  A/B Addressing YES Enable SARM NO
```

**packet**

Displays the parameters for the packet level.

**Example: parameters packet**

Packet Layer Parameters:

```
Default Packet Size = 128 Maximum Packet Size = 256
Log 2 Packet size = 2 Acknowledge Delay = 0
Layer Enabled = YES Default Window Size = 2
Lowest SVC = 1 Highest SVC = 64
Lowest PVC = 0 Highest PVC = 0
Clear Diagnostic = YES Reset Diagnostic = YES
Restart Diagnostic = YES T21 (Call) = 20
T20 (Restart) = 18 R20 (Retry) = 1

T22 (Reset) = 18 R22 (Retry) = 1
T23 (Clear) = 18 R23 (Retry) = 1

Network Type = GTE Equipment Type = DTE
```

**physical**

Displays the parameters for the physical level.

**Example: parameters physical**

Physical Layer Parameters:

```
Interface Type = RS-449
Maximum Frame Size = 1030 InterFrame Delay = 0
Configured Speed = 0 Clocking = External
Protocol Enabled = YES
```

## Statistics

Display the current statistics of any level of the X.25 configuration.

**Syntax:** statistics all  
                  frame  
                  packet  
                  physical

### all

Displays the statistics for the packet, frame, and physical levels.

Example: **statistics all**

### frame

Displays the statistics for the frame level.

Example: **statistics frame**

```
Frame Layer Counters:      Received      Transmitted
Information Frames         0              0
RR Command                 0              0
RR Response                0              0
RNR Command                0              0
RNR Response               0              0
REJ Command                0              0
REJ Response               0              0
SABM                       0              71
SABME                      0              0
UA                         0              0
DISC                       0              0
DM                          0              0
FRMR                       0              0

T1 Timeouts 0   T2 Timeouts 0   N2 Timeouts 1
Bad Address 0   Unsolicited F-Bit 0   Invalid Ctl 0

Frame Layer Miscellaneous:
Queued Output Frames = 0 Protocol Layer State = Link Setup
Send Sequence N(S)   = 0 Receive Sequence N(R)= 0
```

### packet

Displays the statistics for the packet level.

**Example: statistics packet**

| Packet Counters:           | Received | Transmitted |
|----------------------------|----------|-------------|
| Call Request               | 0        | 0           |
| Call Accepted              | 0        | 0           |
| Clear Request              | 0        | 0           |
| Clear Confirm              | 0        | 0           |
| Interrupt Request          | 0        | 0           |
| Interrupt Confirm          | 0        | 0           |
| RR Packet                  | 0        | 0           |
| RNR Packet                 | 0        | 0           |
| REJ Packet                 | 0        | 0           |
| Reset Request              | 0        | 0           |
| Reset Confirm              | 0        | 0           |
| Restart Request            | 0        | 0           |
| Restart Confirm            | 0        | 0           |
| Diagnostic                 | 0        | 0           |
| Data Packet                | 0        | 0           |
| Data Bytes                 | 0        | 0           |
| Buffers Queued             | 0        | 0           |
| Invalid Packets Received = | 0        |             |
| Switched Circuits Opened = | 0        |             |

**physical**

Displays the statistics for the physical level.

**Example: statistics physical**

X.25 Physical Layer Counters:

|          |    |          |     |
|----------|----|----------|-----|
| Rx Bytes | 23 | Tx Bytes | 300 |
|----------|----|----------|-----|

Adapter cable: RS-449 DTE RISC Microcode Revision: 2

Line speed: 19.2kbs

Last port reset: 4 hours, 24 minutes, 20 seconds ago

Input frame errors:

|                    |   |                         |   |
|--------------------|---|-------------------------|---|
| CRC error          | 0 | alignment (byte length) | 0 |
| missed frame       | 0 | too long (> 0 bytes)    | 0 |
| aborted frame      | 0 | DMA/FIFO overrun        | 0 |
| L & F bits not set | 0 |                         |   |

Output frame counters:

|                          |   |                    |   |
|--------------------------|---|--------------------|---|
| DMA/FIFO underrun errors | 0 | Output aborts sent | 0 |
|--------------------------|---|--------------------|---|

**Exit**

Return to the previous prompt level.

**Syntax:** exit

**Example:** exit

## X.25 Network Interfaces and the GWCON Interface Command

While X.25 interfaces have their own console processes for monitoring purposes, bridging routers also display complete statistics for installed network interfaces when you use the **interface** command from the GWCON environment. (For more information on the **interface** command, refer to the GWCON chapter in this guide.)

### Statistics Displayed for X.25 Interfaces

The following statistics display when you run the **interface** command from the GWCON environment for X.25 interfaces:

```
Nt Nt' Interface      CSR Vec    Passed    Failed    Failed
1  1  X25/0      1001620  5D        0         0         0

X.25 MAC/data-link on SCC Serial Line interface
Interface State: DCD  CTS  Packet Layer  Frame Layer  RomRev  0.0
                  OFF  OFF           DOWN         DOWN        X25Rel  3.7

Packet Counters:           Received           Transmitted
Data Packet                0                  0
Data Bytes                 0                  0
Buffers Queued             0                  0
Invalid Packets Received = 0
Switched Circuits Opened = 0

Frame Layer Counters:      Received           Transmitted
Information Frames        0                  0

X.25 Physical Layer Counters:
Rx Bytes                  0  Tx Bytes          0

Adapter cable:           RS-232 DTE  RISC Microcode Revision: 2

V.24 circuit: 105 106 107 108 109
Nicknames:     RTS  CTS  DSR  DTR  DCD
RS-232:       CA  CB  CC  CD  CF
State:        --- ON  --- --- ON

Line speed:           unknown
Last port reset:     2 minutes, 16 seconds ago
```

```

Input frame errors:
CRC error           0   alignment (byte length)           0
missed frame       0   too long (> 0 bytes)               0
aborted frame      0   DMA/FIFO overrun                   0
L & F bits not set 0
Output frame counters:
DMA/FIFO underrun errors 0   Output aborts sent                 0
Interface buffer pool: Total = 30, Free = 30
+

```

The following table describes these general interface statistics:

|                                |   |
|--------------------------------|---|
| <i>Nt</i>                      | Global interface number.  |
| <i>Nt ' </i>                   | Reserved for future dial circuit use.   |
| <i>Intrfc</i>                  | Interface name.   |
| <i>No</i>                      | Number of this interface within interfaces of type "intrfc."  |
| <i>CSR</i>                     | COMM and Status Registers address.  |
| <i>Vec</i>                     | Interrupt vector.   |
| <i>Self-Test:<br/>Passed</i>   | Number of times self-test succeeded.  |
| <i>Self-Test:<br/>Failed</i>   | Number of times self-test failed.   |
| <i>Maintenance:<br/>Failed</i> | Number of maintenance failures.   |
| <i>Interface state</i>         | Display the current state of the input modem control signals, the packet layer (X.25 layer 3), the frame layer (X.25 layer 2), and the current ROM revision and X.25 code revision. |
| <i>Packet Counters</i>         | Provides statistics on packets received and transmitted.  |
| <i>Data Packets</i>            | Displays the number of data packets the interface transmits receives on the network.  |
| <i>Data Bytes</i>              | Displays the number of data bytes the interface transmits receives on the network.  |

|                                     |  |
|-------------------------------------|--|
| <i>Buffers Queued</i>               | Displays the number of buffers currently queued for transmission over the network. These may be frame or packet layer supervisory messages as well as forwarder packets. |
| <i>Invalid Packets Received</i>     | Displays the number of invalid X.25 packets received from the network.   |
| <i>Switched Circuits Open</i>       | Displays the number of switched circuits currently open.   |
| <i>Frame Layer Counters</i>         | Provides statistics generated from Frame Layer counters.   |
| <i>Information Frames</i>           | Displays the number of X.25 Information frames the interface has transmitted and received.   |
| <i>X.25 Physical Layer Counters</i> | Provides statistics generated from Physical Layer counter.   |
| <i>RX Bytes</i>                     | Display the number of bytes received by the Physical layer.  |
| <i>TX Bytes</i>                     | Display the number of bytes transmitted by the Physical layer.   |
| <i>Input frame errors:</i>          |  |
| <i>Adapter cable</i>                | Type of cable.   |
| <i>CRC error</i>                    | Received cyclic redundancy check does not match transmitted CRC.   |
| <i>alignment byte length)</i>       | Count of frame alignment errors.   |
| <i>missed frame</i>                 | Count of missed frames.  |
| <i>too long (&gt; 0 bytes)</i>      | Count of frames longer than 2062 bytes.  |
| <i>aborted frame</i>                | Count of aborted frames.   |

|   |  |
|---|--|
| <i>DMA/FIFO<br/>overrun</i>             | Number of times the router was unable to keep up with data being received because the receive buffer was full.                       |
| <i>L &amp; F bits<br/>not set</i>       | Count of last and first bits not set.  |
| <i>DMA/FIFO<br/>underrun<br/>errors</i> | Number of times the router failed to transmit characters when the transmitter was ready and previously started transmitting a frame. |
| <i>Interface buffer<br/>pool</i>        | Displays the total number of buffers preallocated for this interface and the number of remaining free buffers.                       |



---

## Configuring WAN Restoral

This chapter describes how to configure WAN restoral.

### Before You Begin

Before you configure WAN restoral, you must have the following:

- A primary serial interface (leased line) configured on the router. The primary interface cannot be a dial circuit, and it must be running either PPP or PSL.
- A secondary interface (either V.25 bis or ISDN) with associated dial circuits configured on the router.
- Secondary dial circuits with the idle timer set to zero. Use the **set idle** command at the `Circuit Config>` prompt.
- A secondary dial circuit at one end of the link configured to receive calls only. Use the **set calls inbound** command at the `Circuit Config>` prompt.
- A secondary dial circuit at the other end of the link configured to send calls only. Use the **set calls outbound** command at the `Circuit Config>` prompt.

**Note:** Do not configure any protocol addresses on the secondary interface or the dial circuit. The protocol assignments for the primary interface are used on the secondary link (dial circuit) when it is active.

## Data-Link Layer Configuration

The primary and secondary links must be configured for the same data-link layer protocol, either PPP or PSL. The default is PSL. To determine which link layer protocol is being used on a link, enter **list devices** at the `Config>` prompt. To change the link layer protocol, use the **set data-link** command at the `Config>` prompt.

The only parameter of significance for PSL is frame-size, which must be the same for both the primary link and the secondary link.

All of the upper layer PPP configuration should be exactly the same between the primary link and the secondary link.

For information on PPP, PSL, V.25 *bis*, or ISDN, see the appropriate chapters in this guide.

## Configuration Procedure

This section describes the steps required to configure WAN restoral. Before you begin, enter **list device** at the `Config>` prompt to list the interface numbers of different devices.

Follow these steps to configure WAN restoral on the router.

1. At the `Config>` prompt enter **feature wrs** to display the WRS `Config>` prompt.

```
Config>feature wrs
WAN Restoral user configuration
WRS Config>
```

2. Assign a secondary dial circuit to the primary interface. The secondary dial circuit will back up the primary interface.

```
WRS Config>add secondary-circuit
Secondary interface number [0]? 3
Primary interface number [0]? 1
```

3. Enable WAN restoral on the secondary dial circuit that you added.

```
WRS Config>enable secondary-circuit
Secondary interface number [0]? 3
```

4. Globally enable WAN restoral on the router. For example:

```
WRS Config>enable wrs
```

5. Restart the router for configuration changes to take effect.

## Configuring the Router to Detect Failures Faster

You can adjust the amount of time the router waits before it declares that an interface is down. The default is 4 seconds. To change this setting, use the **set down-notify** command at the `Config>` prompt. For example:

```
Config>set down-notify
Interface number [0]? 1
Down notification time (1 to 300, 0 to restore default)[0]? 2
```

## WAN Restoral Configuration Commands

Table 20–1 lists and the rest of the section explains the WAN restoral configuration commands. Enter these commands at the `WRS Config>` prompt.

**Table 20–1 WAN Restoral Configuration Commands**

| Command         | Function  |
|-----------------|---|
| <b>? (Help)</b> | Lists available commands or options.  |
| <b>Add</b>      | Assigns a dial circuit as the secondary (backup) circuit to a primary interface.  |
| <b>Disable</b>  | Disables WAN restoral on the router or it disables the restoral of a primary interface by disabling its associated secondary interface. |
| <b>Enable</b>   | Enables WAN restoral on the router or it enables a secondary dial circuit.  |
| <b>List</b>     | Displays the current WAN restoral configuration.  |
| <b>Remove</b>   | Removes the assignment of a secondary (backup) circuit to the primary interface.  |
| <b>Exit</b>     | Exits the WAN restoral configuration prompt.  |

## ? (Help)

Lists available commands. You can also enter ? after a command to list its options.

**Syntax:** ?

Example: **enable ?**

```
secondary-circuit  
wrs
```

## Add

Assigns a dial circuit as the secondary (backup) circuit to a primary interface. Both interfaces must have been previously configured. You can assign only one secondary interface to a primary interface. Any dial circuit is an eligible secondary interface.

**Syntax:** add  
                  secondary-circuit . . .

Example: **add secondary-circuit**

```
Secondary interface number [0]? 3  
Primary interface number [0]? 0
```

## Disable

Globally disables WAN restoral on the router or disables a secondary dial circuit.

**Syntax:** disable  
                  secondary-circuit . . .  
                  wrs

**secondary-circuit interface #**

Disables restoral for a primary interface by disabling its associated secondary dial circuit. The circuit remains disabled until you enable it again using the **enable secondary** command. Both interfaces must have been previously configured and bound together using the **add secondary** command.

Example: **disable secondary-circuit**

Secondary interface number [0]? 3

#### **wrs**

Globally disables WAN restoral on the router.

Example: **disable wrs**

#### **Enable**

Globally enables WAN restoral on the router or enables the restoral of a primary interface.

**Syntax:** enable

secondary-circuit . . .

wrs

**secondary-circuit** *interface #*

Enables the restoral of a primary interface by enabling its associated secondary dial circuit. The dial circuit must have been previously assigned using the **add secondary** command.

Example: **enable secondary-circuit**

Secondary interface number [0]? 3

#### **wrs**

Globally enables WAN restoral on the router.

Example: **enable wrs**

#### **List**

Displays the current WAN restoral configuration. It lists each primary and secondary interface and whether or not WAN restoral is enabled.

**Syntax:** list

Example: **list**

WAN Restoral is enabled.

| Primary Interface    | Secondary Interface      | Restoral Enabled |
|----------------------|--------------------------|------------------|
| 0 - Dual Serial Line | 3 - Proteon Dial Circuit | Yes              |
| 1 - Quad Serial Line | 4 - PPP Dial Circuit     | Yes              |

## Remove

Deletes the assignment of a secondary (backup) dial circuit to the primary interface. The dial circuit must have been previously assigned using the **add secondary** command.

**Syntax:** `remove`  
`secondary-circuit ...`

Example: **remove secondary-circuit**  
Secondary interface number [0]? 3

## Exit

Returns to the Config> prompt.

**Syntax:** `exit`

Example: **exit**

---

## Monitoring WAN Restoral

This chapter describes the WAN restoral monitoring commands.

### Displaying the WAN Restoral Monitoring Prompt

To display the `WRS>` prompt enter **feature wrs** at the (+) prompt.

```
+feature wrs
WAN Restoral console
WRS>
```

### WAN Restoral Monitoring Commands

The WAN restoral monitoring commands allow you to monitor the state of the secondary and primary interfaces protected by WAN restoral. Any modifications made using the monitoring commands are not maintained across restarts.

Table 21–1 lists and the following sections explain the WRS monitoring commands.

**Table 21–1 WAN Restoral Monitoring Commands**

| Command         | Function   |
|-----------------|--|
| <b>? (Help)</b> | Lists available commands or options.   |
| <b>Clear</b>    | Clears the monitoring statistics displayed using the <b>list</b> command.            |
| <b>Disable</b>  | Disables WAN restoral on the router or disables the restoral of a primary interface. |
| <b>Enable</b>   | Enables WAN restoral on the router or enables the restoral of a primary interface.   |
| <b>List</b>     | Displays the monitoring information on one or all restored circuits.                 |
| <b>Exit</b>     | Returns to the GWCON (+) prompt.   |

### ? (Help)

Lists available commands. You can also enter ? after a command to list its options.

**Syntax:** ?

Example: ?

```
CLEAR
DISABLE
ENABLE
LIST
EXIT
```

### Clear

Clears WAN restoral statistics that are displayed using the **list** command. This command clears *Longest restoral period*, but does not clear the *Most recent restoral period*.

**Syntax:** clear

Example: **c**lear

### Disable

Disables WAN restoral on the router or disables the restoral of a primary interface by disabling its associated secondary circuit.



**Syntax:**    disable  
                  secondary-circuit . . .  
                  wrs

**secondary-circuit *interface #***

Disconnects active call on the secondary circuit. The circuit remains disabled until you restart or reload the router or until you enter the **enable secondary** command. Both interfaces must have been previously configured and bound together in the WRS configuration.

Example: **disable secondary-circuit**  
                  Secondary interface number [0]? **3**

**Note:** To disable the secondary circuit, enter **disable secondary** at the WAN restoral configuration prompt (WRS Config>).

**wrs**

Disables WAN restoral on the router until you restart or reload the router or enter the **enable wrs** command.

Example: **disable wrs**

**Enable**

Enables WAN restoral on the router or enables the restoral of a primary link by enabling its associated secondary circuit.

**Syntax:**    enable  
                  secondary-circuit  
                  wrs

**secondary-circuit**

Enables the restoral of a primary link by enabling its associated secondary dial circuit.

Example: **enable secondary-circuit**

Secondary interface number [0]? 3

### wrs

Enables the WAN restoral feature on the router.

Example: **enable wrs**

### List

Displays statistics on one or all secondary circuits.

**Syntax:** list

all

secondary-circuit . . .

summary

### all

Provides statistics for all secondary dial circuits and their associated primary interfaces.

Example: **list all**

WAN Restoral is enabled with 1 circuit(s) configured

Total restoral attempts = 3 completions = 2

Total packets forwarded = 346

Longest restoral period in hrs:min:sec 00:08:20

| Primary Interface    | Secondary Interface    | Restoral Enabled |
|----------------------|------------------------|------------------|
| -----                | -----                  | -----            |
| 0 - Dual Serial Line | 3 - Proteon Dial Circu | Yes              |

Router primary interface state = Up

Router secondary interface state = Available

Restoral Statistics:

Primary restoral attempts = 6 completions = 5

Restoral packets forwarded = 346

Most recent restoral period in hrs:min:sec 00:08:20

|   |   |
|---|---|
| <i>Total restoral attempts</i>          | Number of times the primary failed, causing the router to try to bring up a secondary link.   |
| <i>Completions</i>                      | Number of successful restoral attempts.   |
| <i>Total packets forwarded</i>          | Packets forwarded across the secondary interface. It is the sum of both directions, and is cumulative until you restart the router or enter the <b>clear</b> command.   |
| <i>Longest restoral period</i>          | Longest amount of time a restoral was in operation not counting any current usage.  |
| <i>Primary Interface</i>                | Interface that is being backed up.  |
| <i>Secondary Interface</i>              | Dial circuit that is being used to back up the associated primary.  |
| <i>Router primary Interface state</i>   | Indicates that the primary interface state is one of the following: <ul style="list-style-type: none"> <li>• <b>Up</b> – The link is up.</li> <li>• <b>Down</b> – The link is down.</li> <li>• <b>Disabled</b> – The operator has disabled the link.</li> <li>• <b>Not present</b> – The link is configured but there is a hardware problem.</li> </ul>   |
| <i>Restoral Enabled</i>                 | Indicates whether or not WAN restoral is currently enabled on these interfaces.   |
| <i>Router secondary Interface state</i> | Indicates that the associated secondary interface state is one of the following: <ul style="list-style-type: none"> <li>• <b>Up</b> – The link is up.</li> <li>• <b>Down</b> – The link is down. This also occurs when the base network for the secondary is disabled either at the <code>Config&gt;</code> prompt or at the <code>+</code> prompt.</li> <li>• <b>Available</b> – The link is in the waiting mode.</li> </ul> |

*Restoral  
Statistics:*

|  |  |
|--|--|
| <i>Primary<br/>Restoral<br/>Attempts</i>       | Number of times the primary failed, causing the router to try to bring up this secondary link. |
| <i>Restoral<br/>Packets<br/>forwarded</i>      | Packets forwarded over the secondary link.   |
| <i>Most<br/>recent<br/>Restoral<br/>Period</i> | How long the secondary was up, the last time it was used, or currently in use.                 |

**secondary-circuit**

Provides statistics for individual secondary circuits and their associated primary interfaces.

Example: **list secondary-circuit**

Secondary interface number [0]? 1

| Primary Interface  | Secondary Interface    | Restoral<br>Enabled |
|--------------------|------------------------|---------------------|
| - Dual Serial Line | 3 - Proteon Dial Circu | Yes                 |

Router primary interface state = Up  
Router secondary interface state = Available  
Restoral Statistics:

Primary restoral attempts = 6 completions = 5  
Restoral packets forwarded = 346  
Most recent restoral period in hrs:min:sec 00:08:20

## summary

Provides statistics for all secondary circuits.

Example: `list summary`

```
WAN Restoral is enabled with 3 circuit(s) configured

Total restoral attempts =          3 completions =          2
Total packets forwarded =          346

Longest restoral period in hrs:min:sec 00:08:20

Primary Interface and State   Secondary Interface and State
-----
0  SL/0  - Up                 3  SL/1  - Available
```

## Exit

Returns to the GWCON (+) prompt.

**Syntax:** `exit`

Example: `exit`

## WAN Restoral and GWCON Commands

You can test the WAN restoral secondary circuit by entering **test** at the GWCON (+) prompt. This command brings up the link briefly and then takes it back down.

If you use the **disable** command at the GWCON (+) prompt, the router disconnects the current call, but the secondary circuit remains available for WAN restoral. To disable WAN restoral, enter **disable** at the `WRS Config>` prompt.



---

## Configuring ISDN Interfaces

This chapter describes how to configure an ISDN interface on a RouteAbout router.

### Before You Begin

Before you configure ISDN, you need the following information:

- The telephone number of the local ISDN port.
- The destination telephone numbers, including any telephone extensions.
- The type of switch to which the ISDN interface is connected: NET3, INS64, VN3, 5ESS, DMS100, or NI1.
- The TEI (Terminal Endpoint Identifier) of the switch to which the ISDN interface is connected. The TEI is required when the switch does not support automatic TEI assignment.
- The SPID (Service Profile Identifier) of the switch. The SPID is only needed for NI1 and DMS100 switches.

### Configuration Procedures

This section describes how to configure your ISDN interface. The tasks you need to perform are as follows:

1. Adding ISDN addresses.

2. Adding dial circuits.
3. Configuring dial circuit parameters.
4. Configuring ISDN parameters.

You must restart the router for configuration changes to take effect.

## Adding Dial Circuits

Dial circuits are mapped to serial line interfaces. You can map multiple dial circuits to one serial line interface.

To add a dial circuit, use the **add device dial-circuit** command from the `Config>` process. The software assigns an interface number to each circuit. You will use this number to configure the dial circuit.

Example: `Config>add device dial-circuit`  
Adding device as interface 6

**Note:** Dial circuits default to the PPP protocol. You can change the protocol to the Proteon Serial Link (PSL) protocol using the **set data-link psl** command at the `Config>` prompt. Other data-link types (Frame Relay, X.25, V.25 *bis*, SDLC, and SRLY) are not supported at this time.

## Configuring Dial Circuit Parameters

You configure dial circuits from the `Circuit Config>` process. To enter the `Circuit Config>` process, use the **network** command followed by the interface number of the dial circuit. You can use the **list dev** command at the `Config>` prompt to display a list of the dial circuits that you added.

Example: `Config>network 6`  
`Circuit configuration`  
`Circuit Config>`

Use the dial circuit configuration commands described in the next section to configure the dial circuit.

## Dial Circuit Configuration Commands

This section summarizes and explains the dial circuit configuration commands. These commands allow you to display, create, or modify a dial circuit configuration. Enter the dial circuit configuration commands at the `Circuit Config>` prompt.



Table 12–1 lists the dial circuit configuration commands.

**Table 22–1 Dial Circuit Configuration Commands Summary**

| Command             | Function  |
|---------------------|---|
| <b>? (Help)</b>     | Lists the configuration commands or lists the options associated with that command.   |
| <b>Delete</b>       | Deletes the inbound call settings from the dial circuit configuration.  |
| <b>Encapsulator</b> | Allows you to change the data-link protocol configuration.  |
| <b>List</b>         | Displays the dial circuit configuration parameters.   |
| <b>Set</b>          | Configures the dial circuit for inbound or outbound calls, maps the dial circuit to a serial line interface, and sets addresses, idle timeout, and self-test delay. |
| <b>Exit</b>         | Exits the dial circuit configuration process and returns to the <code>Config&gt;</code> prompt.   |

### ? (Help)

List the available commands. You can also enter `?` after a specific command name to list its options.

**Syntax:** ?

Example: ?

```
DELETE
ENCAPSULATOR
LIST
SET
EXIT
```

Example: **set** ?

```
NET
CALLS
DESTINATION
INBOUND DESTINATION
ANY_INBOUND
IDLE
SELFTTEST-DELAY
```

## Delete

Remove the inbound call settings from the dial circuit configuration.

**Syntax:** `delete inbound destination`

### **delete inbound destination**

Removes both the inbound destination and the any\_inbound settings from the dial circuit configuration. This causes the dial circuit to accept calls only from callers that have a phone number that matches the destination parameter.

Example: `delete inbound`

## Encapsulator

Enter the configuration process for the link-layer protocol that is running on the dial circuit. The default protocol for dial circuits is PPP (SLC Config> prompt). You can change the protocol to PSL using the **set data-link** command at the Config> prompt.

**Syntax:** `encapsulator`

Example: `encapsulator`

```
SLC serial user configuration
SLC Config>
```

Be aware of the following when you configure PSL or PPP:

- The serial interface predefines clocking as external and encoding as NRZ. The DCE controls the clock speed. The V.25 *bis* interface ignores those parameters in the PPP or PSL configuration.
- The serial interface does not enforce transmit delay counters that you set in the PSL or PPP configurations.
- Make sure that the PSL frame size of the dial circuits on all routers is set to at least 602. (The default is 2048.) The PSL protocol requires an initial exchange of messages of this size.

- Do not enable pseudo-serial-ethernet on the dial circuit.

To return to the `Circuit Config>` prompt, use the **exit** command.

## List

Display the current dial circuit configuration.

**Syntax:** `list`

Example: `list`

```
Base net:          6
Destination name:  remote-site-baltimore
Inbound dst name:  * ANY *
Inbound dst name:  local-1
Outbound calls    allowed
Inbound calls     allowed
Idle timer        = 60 sec
SelfTest Delay Timer = 0 ms
```

|                             |  |
|-----------------------------|--|
| <i>Base net:</i>            | Name of the serial line interface to which this dial circuit is mapped.  |
| <i>Destination name:</i>    | Network address name to be called for outbound circuits, and the default comparison address used by the caller-ID mechanism for inbound calls. |
| <i>Inbound dst name:</i>    | This parameter appears only if the circuit is configured to accept inbound calls that do not match any other addresses.                        |
| <i>Inbound dst name:</i>    | Alternate comparison address name used by the caller-ID mechanism for inbound calls.   |
| <i>Outbound calls</i>       | Displays this parameter when the circuit is configured to initiate outbound calls.   |
| <i>Inbound calls</i>        | Displays this parameter when the circuit is configured to accept inbound calls.  |
| <i>Idle timer</i>           | Displays the idle timer setting in seconds. The range is 0 to 65535; 0 indicates that this is a dedicated circuit (leased line).               |
| <i>SelfTest Delay Timer</i> | Displays the self-test delay timer setting in milliseconds. The range is 0 to 65535; 0 indicates no delay.                                     |

## Set

Map the dial circuit to a serial line interface; configure the dial circuit for inbound and/or outbound calls; and set destination addresses, inbound addresses, idle timeout, and self-test delay.

**Syntax:**    `set`        `net...`  
                  `calls...`  
                  `destination...`  
                  `inbound destination...`  
                  `any_inbound`  
                  `idle...`  
                  `selftest-delay...`

### **net** *# of serial line interface*

Specifies the number of the serial line interface to which you want to map this circuit.

Example: `set net 2`

### **calls** *outbound or inbound or both*

Restricts this dial circuit to initiating outbound calls only, accepting inbound calls only, or both initiating and accepting calls. The default is both.

Example: `set calls outbound`

### **destination** *address name*

This parameter is required for the dial circuit to operate. It specifies the network dial address of the remote router to which this dial circuit will connect. The caller-ID protocol uses this parameter as the default comparison address for incoming calls.

Example: `set destination remote-site-baltimore`

**inbound destination *address name***

Set this parameter if the dial circuit is set up for both inbound and outbound calls and if this router's local dial address is different from the destination dial address that the remote router dials. For example, the numbers are different if one of the routers goes through a PBX, international, or inter-LATA exchange. This parameter overrides the default comparison address that the caller-ID protocol uses for incoming calls.

Example: `set inbound remote-site-1`

**any\_inbound**

Specifies that inbound calls that do not match any other dial circuit are mapped to this circuit and accepted as inbound calls.

Example: `set any_inbound`

**idle # of seconds**

Specifies a timeout period for the circuit. If there is no protocol traffic over the circuit for this specified time period, the dial circuit hangs up. The range is 0 to 65535, and default is 60 seconds. A zero setting specifies that there is no timeout period and that this is a dedicated circuit (leased line).

**Note:** For WAN-Restoral operations, you must set the idle timeout to 0.

Example: `set idle 60`

**selftest-delay # of milliseconds**

You can use this parameter to delay the time between when the call is established and the initial packet is sent. The range is 0 to 65535, and the default is 150. If your modems take extra time to synchronize, adjust this setting.

**Exit**

Return to the `Config>` prompt.

**Syntax:** `exit`

Example: `exit`

## Adding ISDN Addresses

You need to add an ISDN address for each ISDN interface as well as for each destination. The ISDN address includes

- *Address name.* Description of the address. You can use any string of up to 23 printable ASCII characters. Address names are case sensitive.
- *Network dial address.* Telephone number of the local or destination port. You can enter up to 15 numbers as well as 16 other characters, including spaces and punctuation. The router uses only the numbers.
- *Network subdial address.* Optional. Additional part of the telephone number, such as an extension, that gets interpreted once the interface connects to a PBX. You can enter up to 20 numbers as well as 11 additional spaces and punctuation. The router uses only the numbers.

To add an ISDN address, enter **add isdn-address** at the `Config>` prompt.

```
Config>add isdn-address
Assign address name [1-23] chars []? baltimore
Assign network dial address [1-15 digits][]? 1-555-0983
Assign network subdial address [0-20 digits] []? 23
```

To see a list of your ISDN addresses, enter **list isdn-address** at the `Config>` prompt.

To delete an ISDN address from your list, enter **delete isdn-address** at the `Config>` prompt.

## Configuring ISDN Parameters

This section describes how to configure the ISDN parameters.

1. Display the ISDN `Config>` prompt.

Enter **network** followed by the interface number of the ISDN interface. You can enter **list devices** at the `Config>` prompt to see a list of interface numbers configured on the router.

```
Config>network 2
ISDN user configuration
ISDN Config>
```

2. Specify the network address name of the local port.

Use the **set local-address-name** command. Enter one of the address names you defined using **add isdn-address**.

```
ISDN Config>set local-address-name
Assign local address name []? balitmore
```

3. Specify the type of switch to which this ISDN interface is connected.

Use the **set switch-variant** command. The options are NET3, INS64, VN3, 5ESS, DMS100, and NI1..

```
ISDN Config>set switch-variant
Switch-Variant-Model []? net3
```

4. If you set the switch-variant to NET3 or VN3, set the directory number of the local port.

Use the **set dn0** (directory number 0) command. Enter the network dial address (telephone number) of the ISDN address that you entered using **set local-address-name** in Step 2.

```
ISDN Config>set dn0
Enter DN0 (Directory-Number-0) [ ]?1-555-0983
```

5. Set the TEI to match the signalling TEI number of your ISDN switch. The default TEI is automatic. If the switch to which your ISDN interface is connected does not support automatic TEI signalling, you must set the TEI to a value between 0 and 63. Some switches use two TEI's.

The **set tei** command prompts for a B-channel number if you do not enter it with the command. Check with your service provider to find out what TEI signalling the switch supports.

Use the **set tei** command.

```
ISDN Config>set tei
Enter B-channel Number []
TEI [AUTO]? 10
```

You can enter all the information on one command line using the syntax **set tei n xxx** where **n** is the B-channel number and **xxx** is the TEI number.

6. Set the frame size so that it is greater than or equal to the frame size of the data-link protocol (PSL or PPP) running on the link.

Use the **set framesize** command. The options are 1024, 2048, or 4096 bytes. The default is 2048.

```
ISDN Config>set framesize
Framesize in bytes (1024/2048/4096) [1024]? 2048
```

## Optional ISDN Parameters

This section describes optional ISDN parameters. For a complete description of these commands, see the section, “ISDN Configuration Commands,” on page 22–11.

- If you are using a NET3 or VN3 ISDN switch, you can limit the number of calls to an address that does not respond or that rejects those calls. Use **set retries-call-address** to set the number of calls to a non-responding destination. Use **set timeout-call-address** to set the time period to wait before trying the call again.
- If your ISDN telephone service provides accounting information, you can use the **add accounting entry** command to keep track of telephone charges.
- If your ISDN switch supplies Power Source 1 (PS1), you should enable PS1 on the interface. Enabling PS1 causes the interface to detect when the switch shuts down and to clear all information about the last call before it re-establishes the connection. Use the **enable ps1** command.
- If your ISDN switch does not supply PS1, you should disable PS1 on the interface. Use the **disable ps1** command.
- If you are using an NI1 or DMS100 switch, you must specify service profile identifiers (SPIDs) for each channel. The SPID may contain a maximum of 20 alphanumeric characters. To set the SPID, use the command **set service-profile-id n xxx** where *n* is the B-channel number and *xxx* is the identifier.

When you have finished configuring the ISDN interface, you can use the **list** command to display your configuration.



## ISDN Configuration Commands

Table 22–2 summarizes and the following sections explain the ISDN configuration commands. Enter these commands at the `ISDN Config>` prompt.

**Table 22–2 ISDN Configuration Commands**

| Command         | Function  |
|-----------------|---|
| <b>? (Help)</b> | Lists available commands or the command's options.  |
| <b>Add</b>      | Adds accounting entries to the ISDN configuration.  |
| <b>Disable</b>  | Disables Power Source 1 detection.  |
| <b>Enable</b>   | Enables Power Source 1 detection.   |
| <b>List</b>     | Displays the ISDN configuration.  |
| <b>Remove</b>   | Removes accounting entries from the ISDN configuration.   |
| <b>Set</b>      | Sets the frame size, local address, no answer timeouts, number of retries after no answer, type of ISDN switch, directory numbers, TEI, and SPID. |
| <b>Exit</b>     | Returns to the <code>Config&gt;</code> prompt.  |

### ? (Help)

Lists available commands or lists the command's options.

**Syntax:** ?

Example: `set switch-variant ?`

Valid switch variants are NET3, INS64, VN3, 5ESS, DMS100, and NI1.

### Add

Adds accounting entries to the ISDN configuration.

**Syntax:** `add`  
`accounting-entry . . .`

### **accounting entry *network address name***

If your ISDN telephone service provides accounting information, you can use accounting entries to track telephone charges for specific network addresses. You can add up to eight entries for each ISDN interface. The accounting entry name must match one of the ISDN addresses you entered using **add isdn-address** at the `Config>` prompt.

Example: **add accounting-entry**

```
Assign accounting entry name []? baltimore
```

To display accrued telephone charges, enter **accounting** at the ISDN monitoring prompt (`ISDN>`).

### **Enable**

Enables Power Source 1 (PS1) detection. If your ISDN switch supplies PS1, enable PS1 on the interface. This causes the interface to detect when the switch shuts down and to clear all information about the last call before it re-establishes the connection.

Do not enable PS1 if your switch does not supply Power Source 1.

**Syntax:**    enable  
                  ps1

Example: **enable ps1**

### **Disable**

Disables Power Source 1 detection. PS1 is disabled as the default.

**Syntax:**    disable  
                  ps1

Example: **disable ps1**

## List

Displays the current ISDN configuration.

**Syntax:** `_list`

Example: `list`

```

                                     ISDN Configuration
Local Network Address Name      = line-1-local
Local Network Address          = 1-508-898-1234
Local Network Subaddress       = 21

Maximum frame size in bytes    = 1024
Outbound call address Timeout  = 0 Retries = 0
Switch Variant                 = ETSI NET3
DN0 (Directory Number 0)      = 1-508-898-1234
DN1 (Directory Number 1)      = 1-508-898-3456
TEI                             = Automatic
PS1 detect                     = Disabled
Accounting information kept for the following network
destinations:

Address assigned name          Network Address  Network
Subaddress                    -----
-----
remote-ny1                    100          100
remote-ny2                    200          200
```

## Remove

Removes accounting entries you set using **add accounting-entry**.

**Syntax:** `_remove`  
`accounting-entry . . .`

Example: `remove accounting-entry`

```
Remove accounting entry name []? baltimore
```

## Set

Configures frame size, addresses, and timeouts, and specifies the switch-variant and TEI number.

**Syntax:** `set`  
`framesize` . . .  
`local-address-name` . . .  
`retries-call-address` . . .  
`timeout-call-address` . . .  
`switch-variant` . . .  
`dn0` (directory number 0) . . .  
`dn1` (directory number 1) . . .  
`service-profile-id` . . .  
`tei` (terminal endpoint identifier) . . .

**framesize** *1024 or 2048 or 4096*

The size of the network layer portion of frames transmitted and received on the ISDN interface. Does not include data link and MAC layer headers. Set the frame size so that it is greater than or equal to the frame size of the data-link protocol (PSL or PPP) running on the link.

For PPP, you can change the frame size using the **set hdlc frame-size** command at the `PPP Config>` prompt.

For PSL, you can change the frame size using the **set frame-size** command at the `SLC Config>` prompt.

Example: **set framesize**

```
Framesize in bytes (1024/2048/4096) [1024]? 2048
```

**local-address-name** *address name*

The network address name of the local ISDN interface. This address name must match one of the names that you defined using **add isdn-address** at the `Config>` prompt.

Example: **set local-address-name**

```
Assign local address name []? line-1-local
```

**retries-call-address** *value*

If you set the switch-variant to INS64, you cannot change **retries-call address**. It is fixed at 2.

Some telephone service providers impose restrictions on automatic recalling devices to limit the number of successive calls to an address that is inaccessible or that refuses those calls. **Retries-call-address** specifies the maximum number of calls the router attempts to make to a non-responding address during the timeout period. The range is 0 to 10, and the default is 2. Setting **retries-call-address** to 0 causes the router to retry until the call is established.

Example: **set retries-call-address**

```
Outbound call address retries [0]? 2
```

**timeout-call-address** *# of seconds*

If you set the switch-variant to INS64, you cannot change **timeout-call address**. It is fixed at 180.

After the router reaches the maximum number of **retries-call-address** to a non-responding address, it does not make further calls to that address until this time has expired. The timeout period begins when the router attempts the first call to an address. The range is 0 to 65535 seconds, and the default is 180. Setting **timeout-call-address** to 0 causes the router to retry until the call is established.

Example: **set timeout-call-address**

```
Outbound call address Time-out (secs) [0]? 180
```

**switch-variant** *net3 or ins64 or vn3 or 5ess or dns100 or ni1*

Specifies the model of the switch to which this ISDN interface is connected. The default is NET3.

Example: **set switch-variant**

```
Switch-Variant-Model []? net3
```

### **dn0 network dial address**

If you set the switch-variant to NET3 or VN3, set the directory number of the local port. **Dn0** must match the network dial address (telephone number) you configured using **set local-address-name**.

Example: **set dn0**

```
Enter DN0 (Directory-Number-0) [ ]? 1-508-898-1234
```

### **dn1 network dial address**

Directory number 1 (dn1) is a second directory number supported by NET3 and VN3 switch variants. This implementation does not currently support **dn1**, and the router ignores the **dn1** setting.

### **tei auto or value**

Sets the signalling TEI for the ISDN interface. This setting must match the signalling TEI of your switch. Check with your service provider for the correct TEI signal. The default is automatic. Change this setting only if your switch does not support automatic TEI signalling. The choices are auto, or a value between 0 and 63. Setting the TEI to none disables the ISDN interface. For 5ESS, DMS100, and NI1 switch types, the **set tei** command also prompts for a B-channel number (1 or 2). The TEI is associated with the B-channel you specify.

Example: **set tei**

```
Enter B-channel Number [1]?  
TEI [AUTO]? 60
```

### **service-profile-id SPID string**

Sets the service profile identifier (SPID) for a specified B-channel. The SPID value is ignored if the switch variant is not DMS100 or NI1. This setting must match the SPID assigned by your ISDN service provider. The **SPID string** is an alphanumeric containing from 1 to 20 characters. There is no default value.

Example: **set service-profile-id**

```
Enter B-channel Number [1]?2  
Enter SPID (Service Profile ID) [ ] 0555200001
```

## Exit

Returns to the `Config>` prompt.

**Syntax:** `exit`

Example: `example`





---

## Monitoring ISDN Interfaces

This chapter describes the ISDN monitoring commands and GWCON commands.

### Displaying the ISDN Monitoring Prompt

To display the ISDN monitoring prompt

- Enter **interface** at the GWCON (+) prompt to display a list of interfaces configured on the router.
- Enter **network** followed by the number of the ISDN interface. For example:

```
+network 2
ISDN Console
ISDN>
```

There is no monitoring prompt for dial circuits, but you can monitor the dial circuits that are mapped to the ISDN interface.

### ISDN Monitoring Commands

Table 23–1 summarizes and the following sections explain the ISDN commands. These commands allow you to view the accounting entries, calls, circuits, parameters, and statistics of the ISDN interfaces. Enter the ISDN monitoring commands at the `ISDN>` prompt.

**Table 23–1 ISDN Monitoring Commands**

| <b>Command</b>        | <b>Function</b>  |
|-----------------------|--|
| <b>? (Help)</b>       | Lists available commands or lists a command's options.   |
| <b>Accounting</b>     | Displays accrued telephone charges for addresses added using the ISDN <b>add accounting entries</b> command.   |
| <b>Calls</b>          | Lists the number of completed and attempted connections made for each dial circuit mapped to this interface since the last time statistics were reset on the router. |
| <b>Circuits</b>       | Shows the status of all data circuits configured on the ISDN interface.  |
| <b>Parameters</b>     | Displays the current parameters for the ISDN interface.  |
| <b>Statistics</b>     | Displays the current statistics for the ISDN interface.  |
| <b>Conf_test_cmds</b> | Do not use these commands. They are for use in a development environment only. They can disable the ISDN interface, requiring a router reset.                        |
| <b>Exit</b>           | Returns to the GWCON (+) prompt.   |

### **? (Help)**

Lists available commands or lists the command's options.

**Syntax:** ?

**Example:** ?

```
ACCOUNTING
CALLS
CIRCUITS
PARAMETERS
STATISTICS
CONF_TEST_CMDS
EXIT
```

## Accounting

Displays accrued telephone charges for each network address that you added with the **add accounting entries** ISDN command.

**Syntax:** accounting

Example: **accounting**

|             | Address | SubAddress | Charge |
|-------------|---------|------------|--------|
| v12-31      | 21      | 1          | 0.0    |
| v12-33      | 20      | 1          | 0.0    |
| v1_2-31     | 021     | 001        | 0.0    |
| v1_2-33     | 020     | 001        | 0.0    |
| All others: |         |            | 0.0    |

## Calls

Lists the number of completed and attempted connections made for each dial circuit mapped to this interface since the last time statistics were reset on the router.

**Syntax:** calls

Example: **calls**

| Net                              | Interface | Site Name | In | Out | Rfsd | Blckd |
|----------------------------------|-----------|-----------|----|-----|------|-------|
| 1                                | SL/0      | v403      | 2  | 0   | 0    | 0     |
| 2                                | PPP/1     | v1238     | 0  | 2   | 0    | 0     |
| Unmapped connection indications: |           |           | 0  |     |      |       |

*Net* Network number of the dial circuit mapped to this interface.

*Interface* Type of interface and its instance number.

*Site Name* Network address name of the dial circuit.

*In* Inbound connections accepted for this dial circuit.

*Out* Completed connections initiated by this dial circuit.

*Rfsd* Connections initiated by this dial circuit and refused by the network or the remote destination port.

|   |  |
|---|--|
| <i>Blckd</i>                            | Connection attempts the router blocked. The router blocks connection attempts if the local port is already in use or the maximum number of retries to a non-responding address is reached. |
| <i>Unmapped connection indications:</i> | Connection attempts the router refused because there were no enabled dial circuits configured to accept the incoming calls.  |

## Circuits

Shows the status of all dial circuits configured on the ISDN interface.

**Syntax:** `circuits`

Example: `circuit`

| Net | Interface | MAC/Data-Link  | State | Reason   | Duration |
|-----|-----------|----------------|-------|----------|----------|
| 1   | SL/0      | Proteon Serial | Avail | Rmt Disc | 1:02:25  |
| 4   | PPP/1     | Point to Point | Up B1 | SelfTest | 91:24:03 |
| 5   | PPP/2     | Point to Point | Up B2 | Inbound  | 91:24:00 |

*Net* Network number of the dial circuit mapped to this interface.

*Interface* Type of interface and its instance number.

*MAC/Data-Link* Type of data-link protocol configured for this dial circuit.

*State* Current state of the dial circuit:

- **Up B1 or B2** – Currently connected using the B-channel that is indicated.
- **Available** – Not currently connected, but available.
- **Disabled** – Dial circuit disabled.
- **Down** – Failed to connect because of a busy dial circuit or because the link-layer protocol is down.

*Reason*

Reason for the current state:

- **nnn\_Data** (where *nnn* is the name of a protocol) – The circuit is Up because a protocol had data to send.
- **Rmt Disc** –Remote Disconnect. The circuit is either Down or Available because the remote destination disconnected the call.
- **Opr Req** – Operator Request. The circuit is Available because the last call was disconnected by a monitoring command.
- **Inbound** – The circuit is Up because the circuit answered an inbound call.
- **Restoral** – The circuit is Up because of a WAN-Restoral operation.
- **Self Test** – The circuit was configured as static (idle time=0) and successfully connected once it was enabled.

*Duration*

Length of time that the circuit was in the current state.

## Parameters

Displays the current ISDN configuration.

**Syntax:** parameters

**Example:** **parameters**

```
ISDN Port parameters:

Local Address Name:      v1233
Local Network Address:  20
Local Network Subaddress:
Frame Size:             2048
TEI:                    Automatic
Switch Variant:         France Telecom VNx    PS1 detect:  Disabled
Directory Number 0:     20
Directory Number 1:     21
Outbound call address Timeout:  0           Retries:      0

Accounting Name          Network Address  Network Subaddress
-----
v1215                    22
v1218                    22
v1231                    21
v1233                    20
```

## Statistics

Displays the current statistics for this ISDN interface.

**Syntax:** statistics

**Example:** **statistics**

```
Link:   Active   ISDN Firmware:  0.0   Handler State: Running

          D Channel   B1 Channel   B2 Channel

Total Transmits      32788      230217      164336
Total Receives       32789      164342      208255
Transmit Bytes       196767      22797579    6572177
Receive Bytes        196785      6572411     9517221
Invalid Interrupts   0           0           0

Transmit:   D       B1       B2   Receive:   D       B1       B2
Error       0       0       0   Error      0       5       0
Overflow    0       0       0   Overflow    0       0       0
```

|          |   |   |   |           |   |   |   |
|----------|---|---|---|-----------|---|---|---|
| Underrun | 0 | 0 | 0 | Overrun   | 0 | 0 | 0 |
| Abort    | 0 | 0 | 0 | Abort     | 0 | 5 | 0 |
|          |   |   |   | CRC Error | 0 | 0 | 0 |

This display shows the current state of the link, the firmware revision, and the state of the dial circuit. It also shows statistics on what was transmitted and received on the interface.

## Exit

Returns to the GWCON (+) prompt.

**Syntax:** `exit`

Example: `exit`

## ISDN and the GWCON Commands

The router also displays configuration information and statistics for interfaces and circuits when you use the **interface**, **statistics**, and **error** commands at the GWCON (+) prompt. You can also use the GWCON **test** command to test ISDN interfaces and dial circuits.

**Note:** Issuing the **test** command to the ISDN interface causes the current call to be dropped and re-dialed.

## Interface

Enter the **interface** command at the GWCON prompt (+) to display statistics for ISDN interfaces and dial circuits.

To display the following statistics for a ISDN interface, enter **interface** followed by the interface number of the ISDN interface.

Example: **interface 2**

```

                                Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec      Passed    Failed    Failed
 2  2  ISDN/0        1001640  5C          10         9         0

ISDN Base Net MAC/data-link on ISDN Basic Rate Interface interface
Link:  Active      ISDN Firmware:  1.0    Handler State: Running

                                D Channel    B1 Channel    B2 Channel

Total Transmits                673          55900         21689
Total Receives                 675          47549         17063
Transmit Bytes                 4088         24659589       7389026
Receive Bytes                  4134         8549622        5643732
Invalid Interrupts             0              0              0

Transmit:      D      B1      B2      Receive:      D      B1      B2
Error          0      0      0      Error          0      0      1
Overflow       0      0      0      Overflow       0      0      0
Underrun       0      0      0      Overrun        0      0      0
Abort          0      0      0      Abort          0      0      1
                                CRC Error      0      0      0

```

To display the following statistics for a dial circuit, enter **interface** followed by the interface number of the dial circuit.

Example: **interface 3**

```

                                Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec      Passed    Failed    Failed
 3  2  SL/0        1001640  5C          1         1         0

Point to Point MAC/data-link on ISDN Basic Rate Interface interface

Line Speed          : ~64.000 Kbps
Last port reset    : 0 seconds ago

```

The following describes the output for both ISDN interfaces and dial circuits.

- Nt*                   ISDN interface number or dial circuit interface number.
- Nt'*                 If "Nt" is a dial circuit, this is the interface number of the ISDN interface to which the dial circuit is mapped.
- Interface*           Interface type and instance number.
- CSR*                 Command and status register addresses of base network.



|                                   |  |
|-----------------------------------|--|
| <i>Vec</i>                        | Interrupt vector address.  |
| <i>Self-Test Passed</i>           | Number of successful self-tests.   |
| <i>Self-Test Failed</i>           | Number of unsuccessful self-tests.   |
| <i>Maintenance:<br/>Failed</i>    | Number of maintenance failures.  |
| <i>Line speed</i>                 | Transmit clock speed (approximate).  |
| <i>Last port reset</i>            | Length of time since the port was reset.                                   |
| <i>Input frame<br/>errors:</i>    |  |
| <i>Error</i>                      | Errors other than one of the following error types.                        |
| <i>Overflow</i>                   | Packets that are larger than the defined frame size.                       |
| <i>Overrun</i>                    | Packets received before previously received packets were processed.        |
| <i>Abort</i>                      | Packets aborted by the sender or a line error.                             |
| <i>CRC error</i>                  | Packets received with checksum errors and as a result were discarded.      |
| <i>Output frame<br/>counters:</i> |  |
| <i>Error</i>                      | Errors other than one of the following error types.                        |
| <i>Overflow</i>                   | Packets that are too large for the device buffer.                          |
| <i>Underrun</i>                   | Data was not available when it was needed for the next octet transmission. |
| <i>Abort</i>                      | Packets aborted by upper-level software.                                   |

## Configuration

Enter **configuration** at the GWCON (+) prompt to display information about the router hardware and software. It includes a section that displays the interfaces configured on the router along with the state of the interface.

Note that if a dial circuit is configured to dial on demand, the state of the dial circuit is always displayed as Up whether or not it is connected. In this case Up means that the dial circuit is either connected or available.

If a dial circuit is configured as a static circuit, the state of the displays as Up only if the dial circuit is connected.

**Example: configuration**

```
RtAbt Acces EI/IP, Access: 1 Enet 1T1 1BRI,HW=1,RO=1,#2804,SW=T01.5.002
Hostname: [not configured]
Boot ROM version 2.5 Watchdog timer enabled Auto-boot switch enabled
Console baud rate: 9600
```

```
Num Name Protocol
0 IP DOD-IP
3 ARP Address Resolution
7 IPX NetWare IPX
11 SNMP Simple Network Management Protocol
12 OSPF Open SPF-Based Routing Protocol
```

```
Num Name Feature
1 BRS Bandwidth Reservation
2 MCF MAC Filtering
```

8 Networks:

| Net | Interface | MAC/Data-Link    | Hardware                  | State    |
|-----|-----------|------------------|---------------------------|----------|
| 0   | Eth/0     | Ethernet/802.3   | SCC Ethernet              | Up       |
| 1   | SL/0      | Proteon Serial   | SCC Serial Line           | Up       |
| 2   | V.25/0    | V.25bis Base Net | SCC Serial Line           | Up       |
| 3   | ISDN/0    | ISDN Base Net    | ISDN Basic Rate Interface | Up       |
| 4   | PPP/0     | Point to Point   | ISDN Basic Rate Interface | Up       |
| 5   | PPP/1     | Point to Point   | ISDN Basic Rate Interface | Up       |
| 6   | PPP/2     | Point to Point   | ISDN Basic Rate Interface | Disabled |
| 7   | PPP/3     | Point to Point   | V.25bis Dial Circuit      | Up       |

---

## X.25 National Personalities

This appendix lists the default settings for GTE-Telenet and DDN.

### GTE-Telenet

The following parameters are the default settings for GTE-Telenet:

- Call-req: 20
- Clear-req:
  - Retries: 1
  - Timer: 18
- Disconnect: Passive
- DP-timer: 500 milliseconds
- Frame window size: 7
- Network Type: CCITT
- N2 timeouts: 20
- Packet:
  - Default size: 128
  - Maximum size: 256
  - Window size: 2

- Reset
  - Retries: 1
  - Timer: 18
- Restart
  - Retries: 1
  - Timer: 18
- Standard: 1984
- T1-timer: 4
- T2-timer: 2

## **DDN**

The following parameters are the default settings for DDN:

- Call-req: 20
- Clear-req:
  - Retries: 1
  - Timer: 18
- Disconnect: Passive
- DP-timer: 500 milliseconds
- Frame window size: 7
- Network Type: CCITT
- N2 timeouts: 20
- Packet:
  - Default size: 128
  - Maximum size: 256
  - Window size: 2

- Reset
  - Retries: 1
  - Timer: 18
- Restart
  - Retries: 1
  - Timer: 18
- Standard: 1984
- T1-timer: 4
- T2-timer: 2



---

## Index

### Symbols

?(Help)

Dial circuit configuration commands,  
12–4, 22–3  
Ethernet configuration command, 2–2  
FDDI configuration command, 4–2  
Frame Relay configuration command,  
6–4  
Frame Relay console command, 7–2  
Point-to-Point configuration com-  
mand, 8–2  
Point<#106>to<#106>Point console  
command, 9–2  
Point-to-Point over Frame Relay con-  
figuration command, 10–3  
Point-to-Point over Frame Relay con-  
sole command, 11–2  
Serial Line configuration command,  
14–2  
Token-Ring configuration command,  
16–2  
Token-Ring console command, 3–6,  
17–2  
V.25 bis configuration commands,  
12–9

V.25 bis console commands, 13–2  
X.25 configuration command, 18–6  
X.25 console command, 19–2

### A

Add

Frame Relay configuration command,  
6–5  
X.25 configuration command, 18–6  
Address entries, X.25 network interface,  
18–3  
Addresses, ISDN, 22–8

### C

Calls, V.25 bis console commands, 13–2  
Change, X.25 configuration command,  
18–10  
Change permanent-virtual-circuit,  
Frame Relay configuration com-  
mand, 6–8  
Circuits, V.25 bis console commands,  
13–3  
Clear  
Frame Relay console command, 7–2

- Point-to-Point console command, 9-2
- Point-to-Point over Frame Relay console command, 11-2
- CNX 500 FDDI interface, configuration, 4-1
- Collisions, Ethernet console command, 3-6
- Command summary
  - ISDN configuration, 22-11
  - ISDN monitoring, 23-1
  - WAN restoral configuration, 20-3
  - WAN restoral monitoring, 21-1
- Configuration commands
  - ISDN, 22-11
  - WAN restoral, 20-3
- Configuring
  - ISDN, 22-1
  - WAN restoral, 20-2
- Connector-location, Ethernet configuration command, 16-3
- Connector-Type, Ethernet configuration command, 2-2

## D

- DDN, default settings, A-2
- Delete
  - Dial circuit configuration commands, 12-4, 22-4
  - Point-to-Point over Frame Relay configuration command, 10-18
  - X.25 configuration command, 18-14
- Dial circuit configuration commands
  - ?(Help), 12-4, 22-3
  - delete, 12-4, 22-4
  - encapsulator, 12-4, 22-4

- exit, 12-8, 22-7
- list, 12-5, 22-5
- set, 12-6, 22-6
- summary of, 12-3, 22-2
- Dial circuits
  - adding, 12-2, 22-2
  - configuring, 12-3, 22-2
- Disable
  - Frame Relay configuration command, 6-8
  - X.25 configuration command, 18-16
- Dump, Token-Ring console command, 17-2

## E

- Enable
  - Frame Relay configuration command, 6-10
  - X.25 configuration command, 18-17
- Enabling management, Frame Relay, 6-3
- Encapsulator, Dial circuit configuration commands, 12-4, 22-4
- Ethernet configuration commands
  - ?(Help), 2-2
  - connector-location, 16-3
  - connector-type, 2-2
  - exit, 2-4
  - frame, 2-3
  - IP-encapsulation, 2-3
  - list, 2-4
  - summary of, 2-1
- Ethernet console commands, Collisions, 3-6
- Ethernet network interface, 3-1
  - configuring, 2-1, 3-1
  - monitoring, 2-1, 3-1



## Exit

- Dial Circuit configuration command, 12–8, 22–7
- Ethernet configuration command, 2–4
- FDDI configuration command, 4–10
- Frame Relay configuration command, 6–22
- Frame Relay console command, 7–7
- Point-to-Point configuration command, 8–15, 10–18
- Point<#106>to<#106>Point console command, 9–19
- Point-to-Point over Frame Relay console command, 11–20
- Serial Line configuration command, 14–7
- Token-Ring configuration command, 16–7
- Token-Ring console command, 3–7, 17–4, 17–14
- V.25 bis configuration commands, 12–13
- V.25 bis console commands, 13–8
- X.25 configuration command, 18–43
- X.25 console command, 19–6

## F

### FDDI

- CNX 500 network interface, 4–1, 5–1
- network interface, 5–1

### FDDI configuration commands

- ?(Help), 4–2
- exit, 4–10
- frame, 4–3
- list, 4–3
- set, 4–6

summary of, 4–2

FDDI interface, configuration, 5–1

### Frame

- Ethernet configuration command, 2–3
- FDDI configuration command, 4–3
- Token-Ring configuration command, 16–3

### Frame Relay

- configuring, 6–1
- monitoring, 7–1
- network interface, 7–8
- permanent virtual circuit, PPP-FR pseudo device, 6–6
- static ARP, 6–6

### Frame Relay configuration commands

- ?(Help), 6–4
- add, 6–5
  - permanent-virtual-circuit, 6–5
  - protocol-address, 6–5
- add protocol-address
  - AppleTalk, 6–7
  - AppleTalk Phase 2, 6–7
  - DN protocol, 6–7
  - IP protocol, 6–7
  - IPX protocol, 6–7
- change permanent-virtual-circuit, 6–8
- disable, 6–8
  - cir-monitor, 6–8
  - lmi, 6–8
  - multicast-emulation, 6–8
  - orphan-circuits, 6–8
  - protocol-broadcast, 6–8
- enable, 6–10
  - cir-monitor, 6–10
  - lmi, 6–10
  - multicast-emulation, 6–10
  - orphan-circuits, 6–10
  - protocol-broadcast, 6–10

- exit, 6–22
- list, 6–11
  - lmi, 6–11
  - permanent-virtual-circuits, 6–11
  - protocol-address, 6–11
- remove, 6–16
  - permanent-virtual-circuit, 6–16
  - protocol-address, 6–16
- set, 6–17
  - cir-adjustment, 6–19
  - frame-size, 6–19
  - n1-parameter, 6–19
  - p1-parameter, 6–19
  - t1-parameter, 6–19
- summary of, 6–2

Frame Relay console commands

- ?(Help), 7–2
- clear, 7–2
- exit, 7–7
- list, 7–2
  - all, 7–2
  - circuit, 7–2
  - lmi, 7–2
  - permanent-virtual-circuit, 7–2
- summary of, 7–1

Frame Relay management, enabling, 6–3

Framesize, ISDN, 22–14

## G

- GTE-Telenet, default settings, A–1
- GWCON command
  - and Point-to-Point Protocol interfaces, 9–20
  - and PPP-FR pseudo interfaces, 11–21

- GWCON interface command, 7–8, 14–1, 15–1, 17–14, 19–7
- network interface, 1–1

## H

- HDLC for Point-to-Point interfaces
  - encoding, 8–8
  - idle state, 8–8
  - transmit delay, 8–8

## I

- IP-encapsulation, Ethernet configuration command, 2–3
- ISDN
  - addresses, 22–8
  - configuration commands, 22–11
  - configuration procedures, 22–1
  - GWCON commands
    - configuration, 23–9
    - interface, 23–7
  - ISDN configuration commands
    - add, accounting entry, 22–11
    - disable, ps1, 22–12
    - enable, ps1, 22–12
    - exit, 22–17
    - help, 22–11
    - list, 22–13
    - remove, 22–13
    - set, 22–14
      - dn0, 22–16
      - dn1, 22–16
      - framesize, 22–14
      - local-address-name, 22–14
      - retries-call-address, 22–15
      - switch-variant, 22–15
      - tei, 22–16

- timeout-call-address, 22-15
- ISDN monitoring commands, 23-1
  - accounting, 23-3
  - calls, 23-3
  - circuits, 23-4
  - exit, 23-7
  - help, 23-2
  - parameters, 23-6
  - statistics, 23-6

## L

### List

- Dial circuit configuration commands, 12-5, 22-5
- Ethernet configuration command, 2-4
- FDDI configuration command, 4-3
- Frame Relay configuration command, 6-11
- Frame Relay console command, 7-2
- Point-to-Point configuration command, 8-3
- Point<#106>to<#106>Point console command, 9-3
- Point-to-Point over Frame Relay configuration command, 10-4
- Point-to-Point over Frame Relay console command, 11-3
- Serial Line configuration command, 14-3
- Token-Ring configuration command, 16-4
- V.25 bis configuration commands, 12-9
- X.25 configuration command, 18-18
- X.25 console command, 19-2
- LLC, 17-3

- LLC monitoring commands, 17-4
  - ?(Help), 17-4
  - clear-counters, 17-4
  - list, 17-5
  - set, 17-11

## M

- Management, Frame Relay, enabling, 6-3
- Media, Token-Ring configuration command, 16-5
- Monitoring commands
  - ISDN, 23-1
  - WAN restoral, 21-1

## N

- National Disable, X.25 configuration command, 18-23
- National Enable, X.25 configuration command, 18-27
- National Restore, X.25 configuration command, 18-30
- National Set, X.25 configuration command, 18-36
- Network address, V.25 bis, 12-2
- Network interface configuring, 1-1
  - console process, 1-2
  - monitoring, 1-1

## P

- Packet-size, Token-Ring configuration command, 16-5
- Parameters
  - V.25 bis console commands, 13-5

- X.25 console command, 19–3
- Point-to-Point configuration commands
  - ?(Help), 8–2
  - exit, 8–15, 10–18
  - list, 8–3
  - set, 8–7
    - bncp parameters, 8–7
    - IPCP options, 8–8, 10–12
    - LCP parameters and options, 8–9, 10–12
    - Network Control Protocol parameters, 8–13, 10–16
  - summary of, 8–1
- Point-to-Point console commands, list
  - DECnet statistics, 11–14
  - IP statistics, 11–16
- Point<#106>to<#106>Point console commands
  - ?(Help), 9–2
  - clear, 9–2
  - exit, 9–19
  - list, 9–3
    - AppleTalk Phase 2 statistics, 9–6
    - ATCP statistics, 9–7
    - BNCP statistics, 9–7
    - DECnet statistics, 9–13
    - DNCP statistics, 9–13
    - errors, 9–14
    - IP statistics, 9–14
    - IPCP statistics, 9–15
    - IPX statistics, 9–15
    - IPXCP statistics, 9–16
    - LCP statistics, 9–16
    - OSI statistics, 9–17
    - OSICP statistics, 9–18
  - summary of, 9–1
- Point<#106>to<#106>Point interfaces and the GWCON command, 9–20
  - monitoring, 9–1
- Point-to-Point network interface, configuring, 8–1
- Point-to-Point over Frame Relay configuration commands
  - ?(Help), 10–3
  - configuring, 10–1
  - delete, 10–18
    - local parameters, 10–18
    - remote parameters, 10–18
  - frame relay interface, adding, 10–2
  - list, 10–4
  - PPP–FR pseudo interface
    - adding, 10–2
    - configuring, 10–2
  - set, 10–9
    - bncp parameters, 10–10
    - frame–relay parameters, 10–10
  - summary of, 10–3
- Point-to-Point over Frame Relay console commands
  - ?(Help), 11–2
  - clear, 11–2
  - exit, 11–20
  - list, 11–3
    - AppleTalk Phase 2 statistics, 11–7
    - ATCP statistics, 11–7
    - BNCP statistics, 11–7
    - DNCP statistics, 11–14
    - errors, 11–15
    - frame relay statistics, 11–16
    - IPCP statistics, 11–17
    - IPX statistics, 11–17
    - IPXCP statistics, 11–17
    - LCP statistics, 11–18
    - OSI statistics, 11–19
    - OSICP statistics, 11–19
    - PAP statistics, 11–20

- summary of, 11–1
- Point-to-Point over Frame Relay pseudo interfaces
  - and the GWCON command, 11–21
  - configuring, 10–1
  - monitoring, 11–1
- Protocol
  - configuration process, 1–2
  - console process, 1–2

## R

- Remove permanent-circuit, Frame Relay configuration command, 6–16
  - in use by PPP-FR pseudo device, 6–16

## S

- Serial Line configuration commands
  - ?(Help), 14–2
  - disable, 14–3
  - enable, 14–3
  - exit, 14–7
  - list, 14–3
  - set, 14–5
  - summary of, 14–2
- Serial Line interfaces, configuring, 14–1, 15–1
- Set
  - Dial circuit configuration command, 12–6, 22–6
  - FDDI configuration command, 4–6
  - Frame Relay configuration command, 6–17
  - Point-to-Point configuration command, 8–7
  - Point-to-Point over Frame Relay configuration command, 10–9

- Token-Ring configuration command, 16–5
- V.25 bis configuration command, 12–11
- X.25 configuration command, 18–40
- Source-routing, Token-Ring configuration command, 16–6
- SRT-STAT, Token-Ring console command, 17–3

## Statistics

- V.25 bis console commands, 13–6
- X.25 console command, 19–5
- Switch variant, setting for ISDN, 22–15

## T

- TEI, setting for ISDN, 22–16
- Terminal endpoint identifier. *See* TEI
- Tinygram compression, 8–8, 10–10
- Token-Ring configuration commands
  - ?(Help), 16–2
  - exit, 16–7
  - frame, 16–3
  - list, 16–4
  - media, 16–5
  - packet-size, 16–5
  - set, 16–5
  - source-routing, 16–6
  - summary of, 16–1
- Token-Ring configuration commands, LLC, 17–3
- Token-Ring console commands
  - ?(Help), 3–6, 17–2
  - dump, 17–2
  - exit, 3–7, 17–4, 17–14
  - summary of, 3–5, 17–1
- Token-Ring network interfaces
  - configuring, 16–1
  - monitoring, 17–1

## V

### V.25 bis

- accessing console process, 13-1
- configuring, 12-1
- GWCON commands, 13-8
- monitoring, 13-1
- network address, 12-2

### V.25 bis configuration commands

- ?(Help), 12-9
- exit, 12-13
- list, 12-9
- set, 12-11
- summary of, 12-8

### V.25 bis console commands

- ?(Help), 13-2
- calls, 13-2
- circuits, 13-3
- exit, 13-8
- parameters, 13-5
- statistics, 13-6
- summary of, 13-1

## W

### WAN restoral

- configuration procedure, 20-2
- GWCON commands
  - disable, 21-7
  - test, 21-7
- requirements, 20-1

### WAN restoral configuration commands, 20-3

- add, secondary-circuit, 20-4
- disable, 20-4
  - secondary-circuit, 20-4
  - wrs, 20-5

enable, 20-5

secondary-circuit, 20-5

wrs, 20-5

exit, 20-6

help, 20-4

list, 20-5

remove, secondary-circuit, 20-6

### WAN restoral monitoring commands,

21-1

clear, 21-2

disable, 21-2

secondary-interface, 21-3

wrs, 21-3

enable, 21-3

secondary-circuit, 21-3

wrs, 21-4

exit, 21-7

help, 21-2

list, 21-4

all, 21-4

secondary-circuit, 21-6

summary, 21-7

## X

X.121 network address, 18-3

### X.25 configuration commands

?(Help), 18-6

add, 18-6

change, 18-10

delete, 18-14

disable, 18-16

enable, 18-17

exit, 18-43

list, 18-18

national disable, 18-23

national enable, 18-27

national restore, 18-30

national set, 18-36

- set, 18–40
- summary of, 18–4
- X.25 console commands
  - ?(Help), 19–2
  - exit, 19–6
  - list, 19–2
  - parameters, 19–3
  - statistics, 19–5

- summary of, 19–1
- X.25 network interface, 19–7
  - addressing, 18–3
  - configuring, 18–1
  - monitoring, 19–1
  - national personality, 18–4, A–1
  - node address, 18–3





## HOW TO ORDER ADDITIONAL DOCUMENTATION

### DIRECT TELEPHONE ORDERS

In Continental USA  
call 800-DIGITAL

In Canada  
call 800-267-6215

In New Hampshire  
Alaska or Hawaii  
call 603-884-6660

In Puerto Rico  
call 809-754-7575 x2012

### ELECTRONIC ORDERS (U.S. ONLY)

Dial 800-234-1998 with any VT100 or VT200  
compatible terminal and a 1200 baud modem.  
If you need assistance, call 1-800-DIGITAL.

### DIRECT MAIL ORDERS (U.S. AND PUERTO RICO\*)

U. S. SOFTWARE SUPPLY BUSINESS  
DIGITAL EQUIPMENT CORPORATION  
10 Cotton Road  
Nashua, New Hampshire 03063-1260

### DIRECT MAIL ORDERS (Canada)

DIGITAL EQUIPMENT OF CANADA LTD.  
940 Belfast Road  
Ottawa, Ontario, Canada K1G 4C2  
Attn: A&SG Business Manager

### INTERNATIONAL

DIGITAL  
EQUIPMENT CORPORATION  
A&SG Business Manager  
c/o Digital's local subsidiary  
or approved distributor

Internal orders should be placed through the Software Services Business (SSB)  
Digital Equipment Corporation, Westminister, Massachusetts 01473

\*Any prepaid order from Puerto Rico must be placed  
with the Local Digital Subsidiary:  
809-754-7575 x2012



**READER'S COMMENTS**

What do you think of this manual? Your comments and suggestions will help us to improve the quality and usefulness of our publications.

Please rate this manual:

|              | Poor |   |   | Excellent |   |
|--------------|------|---|---|-----------|---|
| Accuracy     | 1    | 2 | 3 | 4         | 5 |
| Readability  | 1    | 2 | 3 | 4         | 5 |
| Examples     | 1    | 2 | 3 | 4         | 5 |
| Organization | 1    | 2 | 3 | 4         | 5 |
| Completeness | 1    | 2 | 3 | 4         | 5 |

Did you find errors in this manual? If so, please specify the error(s) and page number(s).

---

---

---

---

General comments:

---

---

---

---

Suggestions for improvement:

---

---

---

---

Name \_\_\_\_\_ Date \_\_\_\_\_

Title \_\_\_\_\_ Department \_\_\_\_\_

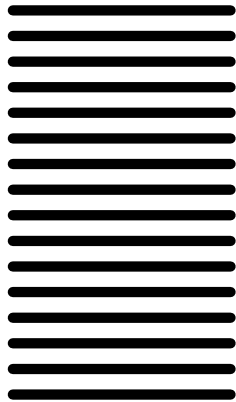
Company \_\_\_\_\_ Street \_\_\_\_\_

City \_\_\_\_\_ State/Country \_\_\_\_\_ Zip Code \_\_\_\_\_

DO NOT CUT – FOLD HERE AND TAPE



NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES



**BUSINESS REPLY LABEL**  
FIRST CLASS PERMIT NO. 33 MAYNARD MASS.

POSTAGE WILL BE PAID BY ADDRESSEE



**Shared Engineering Services**  
550 King Street  
Littleton, MA 01460–1289

DO NOT CUT – FOLD HERE