Distributed Routing Software

Network Interface Operations Guide

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

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Preface

Objectives

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

- Configure, monitor, and use the network interfaces in the bridging router.
- Configure, monitor, and use the budget, telesaving, WAN restoral and X.25 switching features the bridging router.
- Configure, monitor, and use the Dial Circuit and 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.

This preface describes how to use this book and the documentation set to which it belongs.

Using This Guide

The following table helps you locate information in this guide:

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• Accessing the Interface Configuration Process • Network Interfaces and the GWCON Interface Command • Serial Line Configuration Commands • Statistics for the Serial Interfaces	**9** Configuring and Monitoring Serial Line Interfaces
• Accessing the Interface Configuration Process • Token Ring Configuration Commands • LLC Configuration Commands • Token Ring Interfaces and the GWCON Interface Command	**10** Configuring IEEE 802.5 Token Ring Network Interfaces
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• Overview of the Budget Feature • Accessing the Budget Feature Configuration Environment • Basic Configuration Examples • Budget Configuration Commands • Budget Circuit Configuration Commands	**13** Configuring and Monitoring the Budget Feature
• Overview of theTelesaving Feature • Accessing the Telesaving Feature Configuration Environment • Telesaving Configuration Examples • Telesaving Configuration Commands	**14** Configuring and Monitoring the Telesaving Feature

If You Want Information About...	See Chapter or Appendix...
• Accessing the Configuration and Console Processes • WAN Restoral or WAN Reroute • Configuring for WAN Restoral • Configuring for WAN Reroute • Changing From WAN Restoral to WAN Reroute • Changing From WAN Reroute to WAN Restoral • Configuration and Console Commands • WAN Restoral and GWCON Commands	**15** Configuring and Monitoring the WAN Restoral feature
• Accessing the X.25 Switching Feature Configuration and Console Processes • X.25 Switching Basic Configuration Procedures • X.25 Switching Configuration and Console Commands	**16** Configuring and Monitoring the X.25 Switching Feature
• GTE-Telenet • DDN	**A** X.25 National Personalities
• ISDN Cause Codes	**B** ISDN Cause Codes

Using Related Documentation

Digital Documents

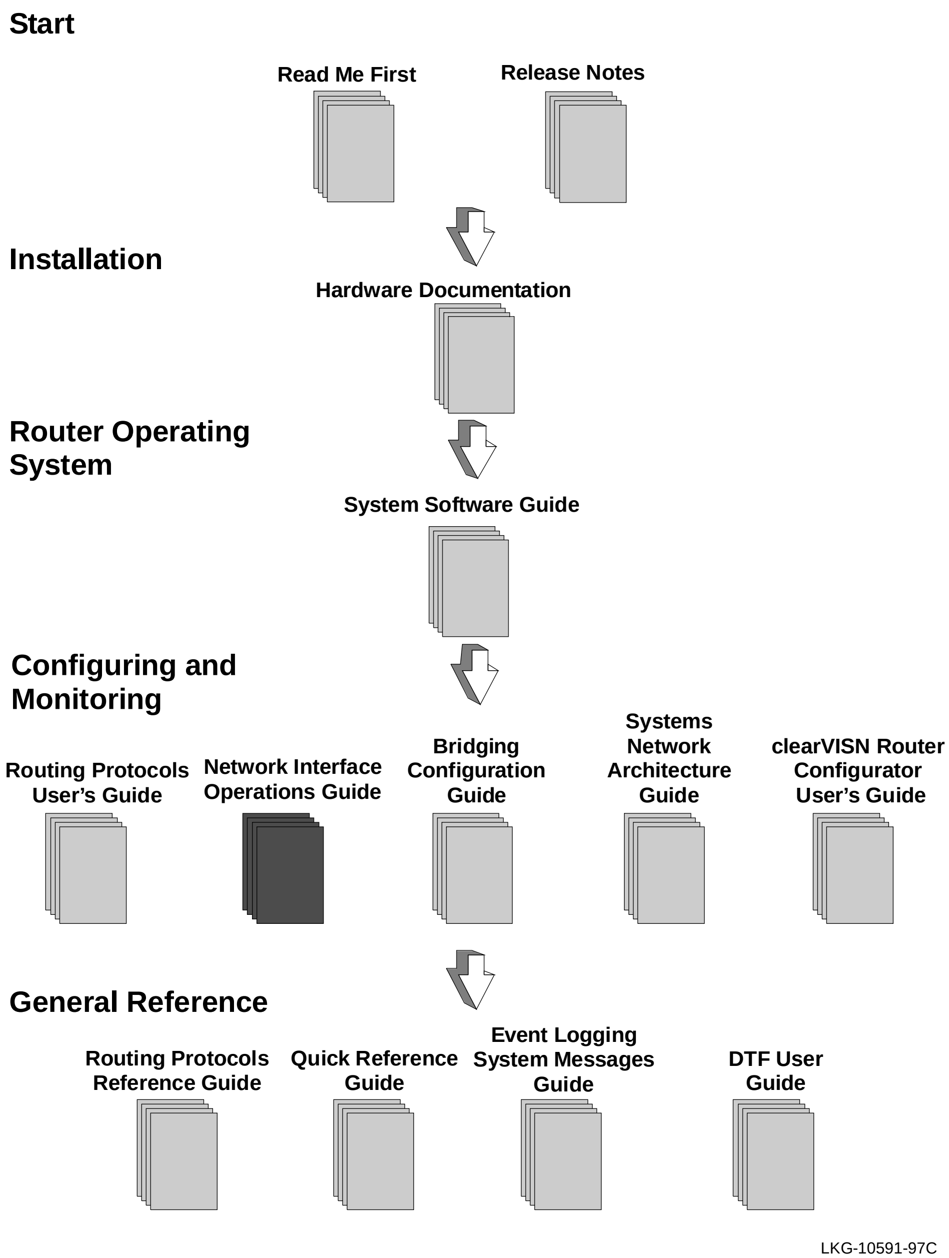
This Document...	Describes...
RouteAbout Access EI Installation EK-DEXBR-IN	Installation and use of the RouteAbout Access EI router.
RouteAbout Access EW Installation EK-DEX2R-IN	Installation and use of the RouteAbout Access EW router.
RouteAbout Access TW Installation EK-DEWTR-IN	Installation and use of the RouteAbout Access TW router.
RouteAbout Central EI Installation EK-DEZBR-IN	Installation and use of the RouteAbout Central EI router.
RouteAbout Central EP Installation EK-DEZPR-IN	Installation and use of the RouteAbout Central EP router.
RouteAbout Central EW Installation EK-DEZ8R-IN	Installation and use of the RouteAbout Central EW router.
Bridging Configuration Guide AA-QL29E-TE	The configuration and monitoring procedures for bridging methods. Bridging features that enhance system performance.
clearVISN Router Configurator User's Guide AA-R08YB-TE	The graphic user interface application which enables you to create and load a basic configuration for the bridging router.
DTF (DIGITAL Trace Facility) User Guide AA-R85DA-TE	How to install and use the DIGITAL Trace Facility, which enables you to trace packets within the protocol layers of the bridging router.
Event Logging System Messages Guide AA-QL2AE-TE	How events are logged, how to interpret Event Logging System (ELS) messages. Provides a description of each ELS message with a corresponding corrective action.

This Document...	Describes...
Quick Reference Guide AA-R7QAA-TE	How to configure and monitor the main protocols, features and interfaces, and lists the associated commands.
Routing Protocols Reference Guide AA-QL2CE-TE	Reference information about the micro-operating system structure, and the protocols and interfaces supported by bridging routers.
Routing Protocols User's Guide AA-QL2DE-TE	Configuring and monitoring the protocols in the Distributed Routing Software bridging router. How to use the DIGITAL Trace Facility.
Systems Network Architecture Guide AA-QU5SC-TE	SNA interfaces and protocols for the Distributed Routing Software System.
System Software Guide AA-QL2EE-TE	Installing, configuring, and operating the Distributed Routing Software system software.

Document Set Structure

Figure 1 shows the structure of the documentation set.

Figure 1 Document Set Structure



Conventions

The following conventions are used in this guide:

`Monospace type`	Monospace type in examples indicates system output or user input.
`Boldface type`	Boldface type in examples indicates user input. Boldface type is also used for file names and command names within text.
lowercase italics	Lowercase italics in command syntax or examples indicate variables for which either the user or the system supplies a value.
[ ]	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.
key	A key name in bold type indicates that you press the specified key.
Ctrl/X	Indicates that you hold the Ctrl key while pressing the key specified by the *X*. The server displays the key combination as ^X.
underscore	Characters underlined in a command listing represent the fewest number of characters you must enter to identify that command to the interpreter.
2-3	In the Index, page reference numbers in bold type indicate a reference to a command description.

Symbols

C M

The configuring and monitoring chapters contain a description of all commands you can use to configure and monitor the protocol, feature, or interface.

C means you use the command to configure the router. You access configuration commands after you enter **talk 6** at the * prompt. Configuration commands change the router's nonvolatile database; a router restart is necessary to activate the change.

M means you use the command to monitor and dynamically configure the router. You access monitoring commands after you enter **talk 5** at the * prompt. Changes made in this mode take effect immediately, but are not made in the router's nonvolatile database (and therefore not preserved after a router restart).

C M means you use the command both to configure and to monitor the router.

Note: **Talk 5** monitoring commands are also referred to as console commands in this guide. **Talk 6** configuration commands are sometimes referred to as config commands.

Commands

Figure 2 shows the components of a command description.

Figure 2 Command Components

> **Command Name**
>
> Description of commands.
>
> **Syntax:** co<u>m</u>mand-name
> p<u>a</u>rameter 1 . . .
> p<u>a</u>rameter 2 . . .
>
> **parameter 1** ***option***
>
> Description of parameter and options.
>
> ***Example:***
>
> **`command name parameter`**
> `Prompt [Default value]?`**`options`**

Command Name	The name of the command followed by an overview description.
Syntax:	The command followed by each parameter you can configure using that command. If an ellipsis follows a parameter, you need to enter additional information (*options*). When you enter a command, you can save time by typing only the underlined letters.
parameter	Description of each parameter.
option	(in italics) Information you must enter with the command and parameter.
Example:	An example of how you enter that command and parameter.

Entering Commands

Instead of being prompted for options, you can save time by entering the complete command on one line. For example, you can enter the **set framesize** command shown in Figure 3 as follows:

```
set framesize 2048
```

If you abbreviate the command using the underlined letters, you can enter

```
s f 2048
```

Figure 3 Set Framesize Command

Set

Configures frame size and local address.

Syntax: set
framesize . . .
parameter 2 . . .

framesize ***1024*** or ***2048*** or ***4096***

The size of the network-layer portion of frames transmitted and received on the interface.

Example:

```
set framesize
Framesize in bytes (1024/2048/4096) [1024]? 2048
```

Accepting the Current Setting

When the software prompts you for information, the current setting appears in brackets [ ]. To accept the information in the brackets, press **Return**. In this example, the current setting is 1024.

```
Framesize in bytes (1024/2048/4096) [1024]?
```

Correspondence

Documentation Comments

If you have comments or suggestions about his document, send them to the DIGITAL Network Products Business Organization.

Attn:	Documentation Project Manager
E-MAIL:	doc_quality@lkg.mts.dec.com

Online Services

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Network Interfaces

1

Getting Started with Network Interfaces

This guide 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.

1.1 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*.

1.1.1 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 these steps:

1. Enter the following command at the OPCON prompt:

   ```
   * talk 6
   ```

   The console displays the CONFIG prompt (`Config>`). Now you can enter CONFIG commands. If the prompt does not appear, press the **Return** key again. To exit CONFIG and return to OPCON, enter the OPCON intercept character **Ctrl/P** (hold the Ctrl key down and press P).

2. 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>
```

3. 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>
```

Note: Configuration changes that you make to the protocol parameters do not take effect until you restart the router.

The changes you make through CONFIG are retained in a configuration database in non-volatile memory. They are retained during power downs and are recalled when you restart the router.

To restart the router, enter the OPCON **restart** command. For example:

```
* restart

Are you sure you want to restart the router? (Yes or No)[No]: yes
```

1.1.2 Accessing Network Interface Console Processes

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

Note: In this guide, the term *console process* means the same as the term *monitoring process*. The terms *console commands* and *monitoring commands* are interchangeable.

Unlike configuration commands, console commands take effect immediately, but do not become part of the router's non-volatile configuration memory. Thus, while console commands let you make real-time changes to the router's configuration, the changes are only temporary. The configuration memory overwrites them when the router restarts.

The console process is used to:

- Monitor the protocols and network interfaces currently in use by the router.
- Display ELS (Event Logging System) messages relating to router activities and performance.
- Make real-time changes to the configuration without permanently affecting the router’s non-volatile configuration memory.

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
                                Self-Test  Self-Test  Maintenance
Nt Nt’ Interface       CSR  Vec    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>
```

1.2 Accessing Link Layer Protocol Management 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.

2

Configuring and Monitoring Dial Circuits

This chapter describes how to configure and monitor Dial Circuits in the router.

A network interface used to make dial connections may either be connected to a V.25 *bis* modem or to an ISDN line. You must configure the network interface, create a Dial Circuit device and map it to the interface. The datalink protocols which may be used over the Dial Circuit depend on the type of network interface used.

You can configure PPP, Multilink PPP or PSL as the datalink protocol over both V.25 *bis* interfaces and ISDN interfaces. Frame Relay and X.25 are also supported as datalink protocols over ISDN.

In addition to the above Dial Circuits you can configure PPP-FR Dial Circuits. These circuits make use of a Frame Relay SVC on a Frame Relay interface. Only PPP or Multilink PPP datalink protocols are supported for these Dial Circuits.

The tasks you need to perform to configure Dial Circuits depend on the network interface you are using, and the datalink protocol you will run over the interface.

For more information about ISDN, V.25 *bis*, X.25 and Frame Relay, refer to the *Routing Protocols Reference Guide*.

2.1 Configuring V.25 *bis* Dial Circuits

This section describes how to configure Dial Circuits for V.25 *bis*. The tasks you need to perform are:

1. Set up a V.25 *bis* network interface.
2. Either add a network address name and network address, or configure the modem to dial the remote station.
3. Add Dial Circuits.
4. Configure Dial Circuit parameters.
5. Configure V.25 *bis* network interface parameters.

2.1 Configuring V.25 bis Dial Circuits

The rest of this section describes these tasks. Refer to Chapter 11 for details of the commands used to configure the V.25 *bis* network interface.

Note: You must restart the router for changes to the configuration to take effect.

2.1.1 Configuring the Modem for DTR Dialing

If you are using a modem which does not support V.25 *bis* auto-calling on a V.25 *bis* circuit, you will need to use the DTR dialing procedure. This procedure uses the modem's direct call operating mode. You must manually configure the local modem with the dial address of the remote destination. Use a terminal to access the modem and enter the configuration commands to store the remote dial address in the modem's default dialing register. Refer to your modem's documentation for more information about manually configuring the modem.

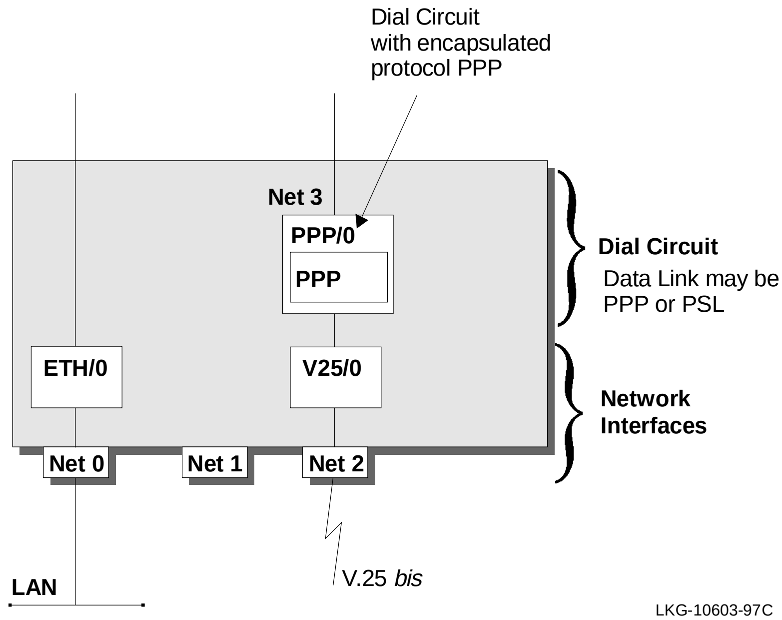
2.1.2 Setting Up a V.25 *bis* Dial Circuit

Dial Circuits are mapped to V.25 *bis* network interfaces. You can map multiple Dial Circuits to one V.25 *bis* network interface.

Figure 2–1 illustrates an imaginary router with one Ethernet port (Net 0) and two serial ports (Net 1 and Net 2). The serial port Net 2 has been configured with datalink protocol V.25 *bis*, so the interface name is V25/0. A Dial Circuit has been added as Net 3 and its datalink is set to PPP by default, so the interface name is PPP/0. This is indicated by the protocol PPP shown in a box, "encapsulated" within the interface.

The procedure which follows demonstrates how to set up this configuration.

Figure 2–1 Configuring a V.25 *bis* Dial Circuit



1. Set the datalink protocol of the network interface Net 2 to be V.25 *bis*. For example, to set interface 2 to V.25 *bis*, enter the following:

```
Config>set data v25bis 2
Config>
```

2. Add a Dial Circuit (Net 3 in this example). The protocol will be PPP by default.

```
Config>add device dial-circuit
Config>
```

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

3. Add V.25 *bis* network addresses. Enter a network address name and a network dial address name for each local port (serial line interface) and 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.

```
Config>add v25-bis-address locaddrname locdialaddr
Config>add v25-bis-address remaddrname remdialaddr
Config>
```

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
Config>
```

Note: If you are using DTR dialing, you do not need perform this step.

4. Configure the V.25 *bis* network interface (in this example network 2). At the `Config>` prompt enter **network 2** to display the `V.25bis Config>` prompt.

```
Config>network 2
V.25bis Configuration
V.25bis Config>
```

Use the V.25 *bis* configuration commands described in Chapter 11 to configure the interface. For example, if you are *not* using DTR dialing, set the local address to the network address name of the local port (this must match the **local** name you specified at the `Config>` prompt).

```
V.25bis Config>set local-address locaddrname
V.25bis Config>
```

5. Return to the `Config>` prompt.

```
V.25bis Config>exit
Config>
```

6. At the `Config>` prompt enter **network 3** to display the `Circuit Config>` prompt so you can configure the Dial Circuit (network 3 in our example).

```
Config>network 3
Circuit configuration
Circuit Config>
```

7. Set the destination address to the network address name of the remote port (this must match the **remote** name you specified at the `Config>` prompt).

```
Circuit Config>set destination remaddrname
Circuit Config>
```

8. Map the Dial Circuit (network 3) to the V.25 *bis* interface (network 2).

```
Circuit Config>set network 2
Circuit Config>
```

   Use the Dial Circuit configuration commands described in Section 2.5 to configure the Dial Circuit.

9. Use the **encapsulator** command to configure the datalink protocol. When you have configured the protocol, use the **exit** command to return to the `Circuit Config>` prompt.

```
Circuit Config>encapsulator
PPP Config> . . .
PPP Config>exit
Circuit Config>
```

10. At the `Circuit Config>` prompt, set the call direction. You must set calls **inbound** at one end of the Dial Circuit, and **outbound** at the other end.

```
Circuit Config>set calls direction
Circuit Config>
```

11. On the **inbound** router, you must allow incoming calls from the remote destination. Use the set inbound command and specify either the **remote** name you specified at the `Config>` prompt, or **any** to accept all incoming calls.

```
Circuit Config>set inbound remote-destination
Circuit Config>
```

12. On the **outbound** router define the number to call. Set the destination address of the remote router (this must match the **remote** name you specified at the `Config>` prompt).

13. Set the destination address of the remote router (this must match the **remote** name you specified at the `Config>` prompt).

```
Circuit Config>set destination remaddrname
Circuit Config>
```

14. Return to the `Config>` prompt.

```
Circuit Config>exit
Config>
```

2.2 Configuring Dial Circuits over ISDN

This section describes how to configure Dial Circuits on an ISDN network interface. The tasks you need to perform are:

1. Set up an ISDN network interface.

2. Add a network address name and network address.
3. Add Dial Circuits.
4. Configure Dial Circuit parameters.
5. Configure ISDN interface parameters.

The rest of this section describes these tasks in more detail. To configure the ISDN interface, use the ISDN configuration commands described in Chapter 6.

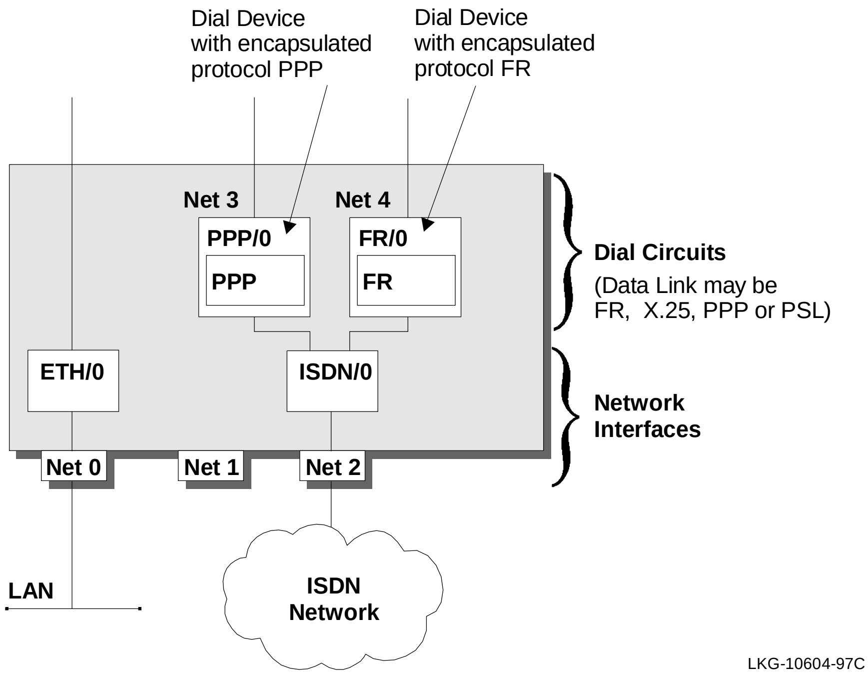
Note: You must restart the router for changes to the configuration to take effect.

2.2.1 Setting Up Dial Circuits over ISDN

Dial Circuits are mapped to a base network interface. When you map the circuit to an ISDN network interface, it uses one of the B-channels on that device. You can map multiple Dial Circuits to one network interface. Basic Rate ISDN (BRI) has two B-channels, while Primary Rate ISDN has 23 B-channels on a T1 line (PRI-T1) or 30 B-channels on an E1 line (PRI-E1).

Figure 2–2 illustrates an imaginary router (such as an “EI” family router) with one Ethernet port (Net 0) and two other ports (Net 1 and Net 2). The port at Net 2 is a Basic Rate ISDN interface, and the interface name is ISDN/0. A Dial Circuit has been added as Net 3 and its datalink is set to PPP by default, so the interface name is PPP/0. This is indicated by the protocol PPP shown in a box, “encapsulated” within the interface. Another Dial Circuit has been added as Net 4 and its datalink is set to FR (Frame Relay), so the interface name is FR/0. This is indicated by the protocol FR shown in a box, encapsulated within the interface.

Figure 2–2 Configuring ISDN Dial Circuits



The procedure which follows demonstrates how to set up this configuration.

1. Add a Dial Circuit (for example on interface 3). The protocol will be PPP by default.

```
Config>add device dial-circuit
Config>
```

2. If you are not going to use PPP, change the datalink protocol to Frame Relay, Proteon Serial Link (PSL) or X.25, using the **set data-link** command at the `Config>` prompt. Other datalink types (SDLC, and SRLY) are not supported over ISDN.

```
Config>set data-link frame-relay 3
Config>
```

2.2 Configuring Dial Circuits over ISDN

3. Add an ISDN network address. Enter a network address name and a network dial address name for each local port (network interface) and for each destination port. The network dial address is the ISDN number of the local or destination port. The network address name can be anything, such as a description of the port.

```
Config>add isdn-address locaddrname locdialaddr
Config>add isdn-address remaddrname remdialaddr
Config>
```

Example:

```
Config>add isdn-address
Assign address name [1-23] chars []? remote-site-baltimore
Assign network dial address [1-20 digits] []? 1-909-555-0983
Assign network subdial address [0-20 digits] []?
Config>
```

4. Configure the ISDN network interface (in this example network 2). At the `Config>` prompt enter **network 2** to display the `ISDN Config>` prompt.

```
Config>network 2
ISDN Configuration
ISDN Config>
```

5. Use the ISDN configuration commands described in Chapter 6 to configure the interface. For example, set the local address to the network address name of the local port (this must match the **local** name you specified at the `Config>` prompt).

```
ISDN Config>set local-address locaddrname
ISDN Config>
```

6. Return to the `Config>` prompt.

```
ISDN Config>exit
Config>
```

7. At the `Config>` prompt enter **network 3** to display the `Circuit Config>` prompt so you can configure the Dial Circuit (network 3 in our example).

```
Config>network 3
Circuit configuration
Circuit Config>
```

8. Set the destination address to the network address name of the remote port (this must match the **remote** name you specified at the `Config>` prompt).

```
Circuit Config>set destination remaddrname
Circuit Config>
```

9. Map the Dial Circuit (network 3) to the ISDN interface (network 2).

```
Circuit Config>set network 2
Circuit Config>
```

   Use the Dial Circuit configuration commands described in Section 2.5 to configure the Dial Circuit.

10. Use the **encapsulator** command to get the command prompt to configure the datalink protocol (PPP, PSL, Frame Relay or X.25). The command prompt to configure an encapsulated protocol is the same as the prompt for an interface of that type, for example `FR Config>.` However, commands which configure the physical level characteristics are not relevant for the encapsulated protocol since the data is being transferred over ISDN. These commands are not available when configuring an encapsulated protocol. Refer to the appropriate chapter for details about configuring each protocol.

```
Circuit Config>encapsulator
FR Config>
FR Config> . . .
FR Config>exit
Circuit Config>
```

11. At the `Circuit Config>` prompt, set the call direction. You must set calls **inbound** at one end of the Dial Circuit, and **outbound** at the other end.

```
Circuit Config>set calls direction
Circuit Config>
```

12. On the **inbound** router, you must allow incoming calls from the remote destination. Use the set inbound command and specify either the **remote** name you specified at the `Config>` prompt, or **any** to accept all incoming calls.

```
Circuit Config>set inbound remote-destination
Circuit Config>
```

13. On the **outbound** router define the number to call. Set the destination address of the remote router (this must match the **remote** name you specified at the `Config>` prompt).

14. Set the destination address of the remote router (this must match the **remote** name you specified at the `Config>` prompt).

```
Circuit Config>set destination remaddrname
Circuit Config>
```

15. Return to the `Config>` prompt.

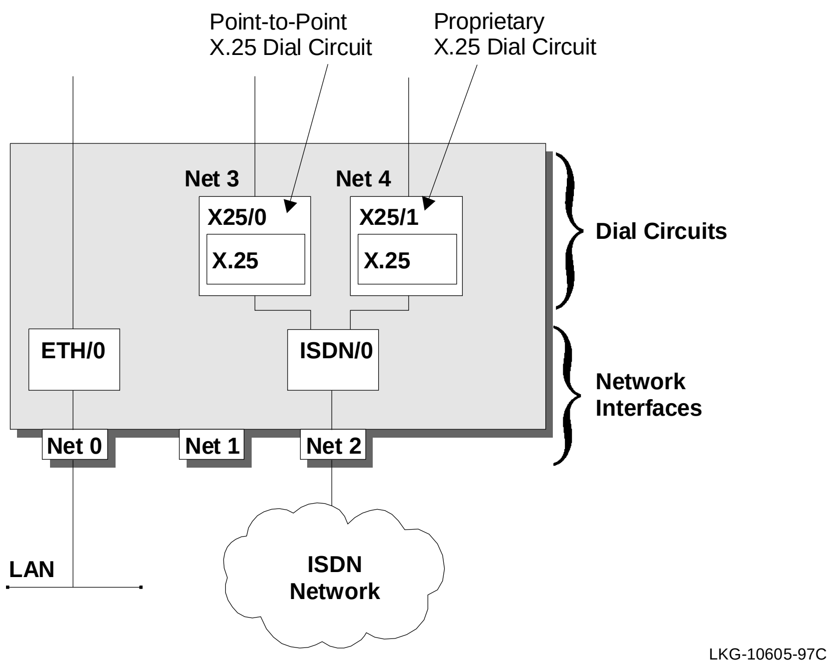
```
Circuit Config>exit
Config>
```

2.2.2 Using X.25 Dial Circuits over ISDN

You can configure X.25 SVCs over X.25 on an ISDN Dial Circuit. When the datalink protocol of the Dial Circuit is set to X.25, you use the **encapsulator** command at the `Circuit Config>` prompt to get to the `X.25 Config>` prompt.

Figure 2–3 illustrates an imaginary router with one Ethernet port (Net 0) and two other ports (Net 1 and Net 2). The port at Net 2 is an ISDN Basic Rate interface, so the interface name is ISDN/0. Dial Circuits have been added as Net 3 and Net 4 and their datalinks set to X.25, so the interface names are X25/0 and X25/1. This is indicated by the protocol X.25 shown in a box, “encapsulated” within the interface.

Figure 2–3 Configuring X.25 Dial Circuits over ISDN



You configure the X.25 options of the Dial Circuit as you would configure an X.25 interface, with some minor differences. You can either use the X.25 Dial Circuit as a point-to-point connection, or you can use it in proprietary mode. In point-to-point mode the ISDN link is kept open when the SVC is idle by sending idle messages. In proprietary mode the ISDN line is allowed to go down when X.25 is idle.

- **X.25 Dial Circuit in Point-to-Point Mode**. The dial type of the X.25 Dial Circuit is set to point-to-point by default. You must use the **national set idle-frame-timer** command to set the idle timer for the refresh messages. The following dialogue configures a new Dial Circuit as interface 6, sets the datalink to X.25, and maps the dial Dial Circuit to the ISDN device (interface 2). It is not strictly necessary to set the dial-type since the default value is point-to-point, but the idle-frame-timer is required.

Example:

```
Config> add device dial-circuit
Adding device as interface 3
Config> set data-link x.25 3
Config> net 3
Circuit Config> set net 2
Circuit Config> encapsulator
X.25 Config> set dial-type point-to-point
X.25 Config> national set idle-frame-timer 30
X.25 Config>
```

- **X.25 Dial Circuit in Proprietary Mode**. You must set the dial type to proprietary if you want to allow the ISDN line to go down when there is no X.25 data traffic. The following dialogue configures a new Dial Circuit as interface 7, sets the datalink to X.25, and maps the Dial Circuit to the ISDN device (interface 2). It then sets the dial-type to proprietary mode.

Example:

```
Config> add device dial-circuit
Adding device as interface 4
Config> set data-link x.25 4
Config> net 4
Circuit Config> set net 2
Circuit Config> encapsulator
X.25 Config> set dial-type proprietary
X.25 Config>
```

See Chapter 12 for details about configuring the X.25 options on the Dial Circuit.

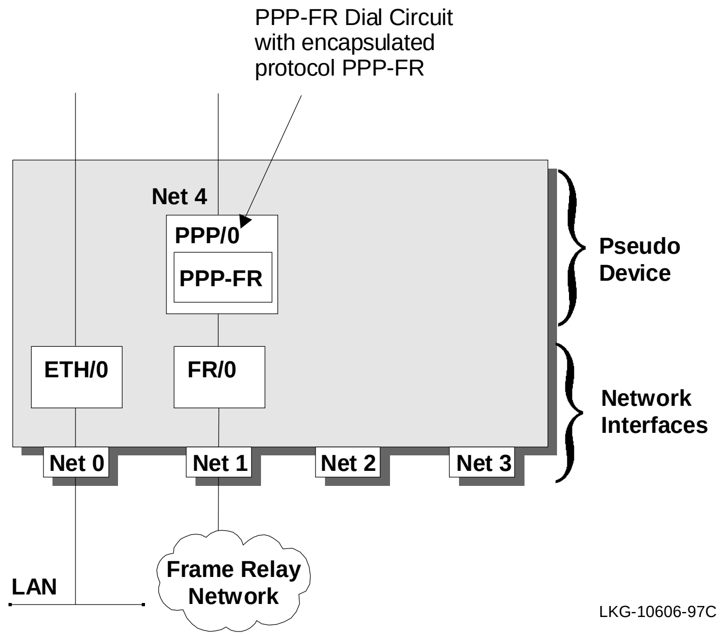
2.3 Configuring PPP-FR Dial Pseudo Interfaces

This section describes how to configure your router to encapsulate Point-to-Point Protocol over a Frame Relay SVC using a PPP-FR Dial pseudo interface.

You can map multiple PPP-FR Dial pseudo devices to one Frame Relay interface, but each has its own SVC. The DIGITAL RouteAbout Access 90 supports a maximum of 8 PPP-FR pseudo interfaces, and the DIGITAL RouteAbout Central 900 can support up to 32.

Figure 2–4 illustrates an imaginary router with one Ethernet port (Net 0) and 4 serial ports (Net 1 , Net 2 and Net 3). The serial port Net 2 has been configured with datalink protocol FR, so the interface name is FR/0. A PPP-FR Dial pseudo device has been added as Net 4, and its interface name is PPP/0. The encapsulated protocol is PPP-FR, shown in a box "encapsulated" within the interface.

Figure 2–4 Configuring PPP-FR Dial Circuits



2.3 Configuring PPP-FR Dial Pseudo Interfaces

The procedure which follows demonstrates how to set up the Dial Circuit aspects of this configuration (refer to the appropriate chapters for more information about configuring Frame Relay and PPP over Frame Relay):

1. Configure the serial network interface Net 1 to use Frame Relay with SVCs enabled. Follow the procedure described in Chapter 5 to configure a Frame Relay interface with Frame Relay SVCs and enable the SVCs.

2. Add a PPP-FR Dial Circuit. PPP-FR Dial pseudo devices are mapped to SVCs over a Frame Relay interface.

```
Config> add device ppp-fr-dial
Adding device as interface 4
```

3. Add a Frame Relay network address using the **add frame-relay-address** command. Enter a network address name and a network dial address name for each local port (Frame Relay interface) and for each destination port. The network dial address is the number of the local or destination port. The network address name can be anything, such as a description of the port.

Example:

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

4. Configure the PPP-FR Dial pseudo interface (Net 4 in our example) using the `Circuit Config>` process.

```
Config>network 4
Circuit configuration
Circuit Config>
```

5. Set the destination address to the network address name of the remote port (this must match the **remote** name you specified at the `Config>` prompt).

```
Circuit Config>set destination remaddrname
Circuit Config>
```

6. Map the PPP-FR Dial pseudo device (network 4) with the Frame Relay interface (network 1) using the **set network** command. This command prompts for Frame Relay attributes.

```
Circuit Config>set net 1
Require matching information rates? [Yes]:
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc) in bits [64000]?
Excess Burst Size (Be) in bits [0]?
```

7. Use the **encapsulator** command to access the PPP-FR process. Configure the PPP characteristics of the PPP-FR Dial pseudo device using the commands described in Chapter 8. The commands which relate to HDLC do not apply to PPP-FR Dial pseudo interfaces since all data transfer is performed by the Frame Relay protocol. These commands will be suppressed for this process.

```
Config>encapsulator
Point-to-Point over Frame Relay user configuration
PPP-FR Config>
PPP-FR Config> . . .
PPP-FR Config>exit
Circuit Config>
```

8. At the `Circuit Config>` prompt, set the call direction. You must set calls **inbound** at one end of the Dial Circuit, and **outbound** at the other end.

```
Circuit Config>set calls direction
Circuit Config>
```

9. On the **inbound** router, you must allow incoming calls from the remote destination. Use the set inbound command and specify either the **remote** name you specified at the `Config>` prompt, or **any** to accept all incoming calls.

```
Circuit Config>set inbound remote-destination
Circuit Config>
```

10. On the **outbound** router define the number to call. Set the destination address of the remote router (this must match the **remote** name you specified at the `Config>` prompt).

11. Set the destination address of the remote router (this must match the **remote** name you specified at the `Config>` prompt).

```
Circuit Config>set destination remaddrname
Circuit Config>
```

12. Return to the `Config>` prompt.

```
Circuit Config>exit
Config>
```

You must restart the router for these changes to the system configuration to take effect.

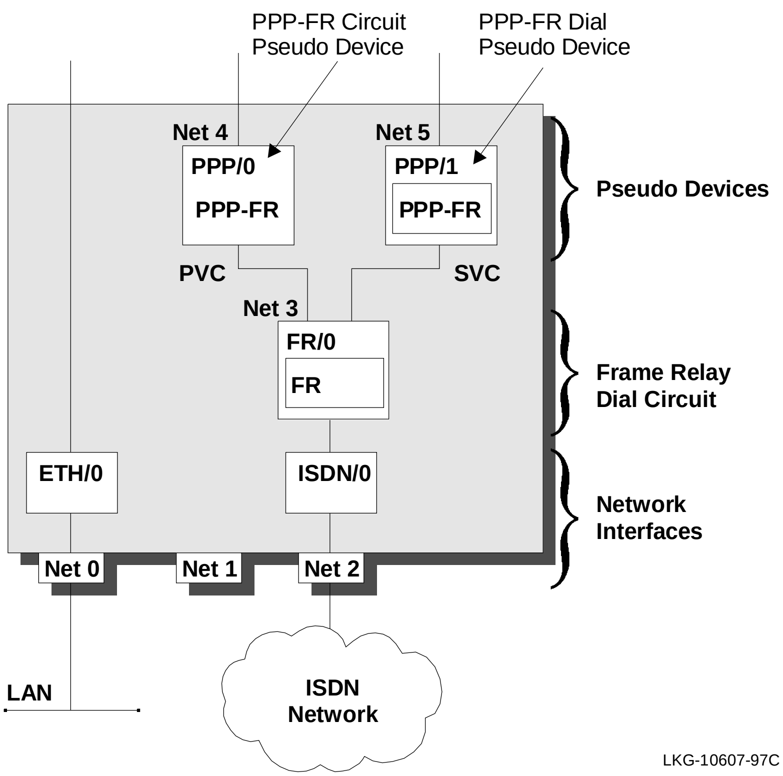
2.3 Configuring PPP-FR Dial Pseudo Interfaces

2.3.1 Using PPP-FR Pseudo Devices over ISDN

As we saw in Section 2.2.1, you can configure a Frame Relay Dial Circuit over an ISDN network interface. To configure PPP-FR pseudo devices to run over an ISDN Dial Circuit, you set up a Frame Relay Dial Circuit over ISDN and use that Dial Circuit as the base network for the PPP-FR pseudo device.

Figure 2–5 illustrates an imaginary router with one Ethernet port (Net 0) and 2 serial ports (Net 1 and Net 2) which has been set up to run PPP over a Frame Relay PVC and a Frame Relay SVC using a Frame Relay Dial Circuit over an ISDN interface.

Figure 2–5 Configuring PPP-FR Pseudo Devices over ISDN



The port at Net 2 is an ISDN Basic Rate interface, so the interface name is ISDN/0. A Dial Circuit has been added as Net 3 and its datalink set to Frame Relay, so its interface name is FR/0. A PPP-FR Circuit pseudo device has been added as Net 4 and its interface name is PPP/0. It is not a dial-type circuit since it uses a Frame Relay PVC, so it is configured using the `PPP-FR Config>` process directly (the protocol PPP-FR is not encapsulated).

Finally, a PPP-FR Dial pseudo device has been added as Net 5 (the encapsulated protocol is PPP-FR, shown in a box "encapsulated" within the interfaces).

Accessing Net 4 gives the `PPP-FR Config>` prompt and you map the PPP-FR Circuit pseudo device to a PVC on the Frame Relay Dial Circuit using the **set frame-relay 3** command. Accessing Net 5 gives the `Circuit Config>` prompt because it is a PPP-FR Dial pseudo device. Use the **set net 3** command to map the PPP-FR Dial pseudo device to an SVC on the Frame Relay Dial Circuit.

2.4 Calling Line Identification (Caller ID)

In certain configurations of earlier versions of the software, a call with invalid Calling Line Identification (CLID) information (that is, a caller that did not match any Dial Circuit) would have been allowed to connect via the Line ID (LID) protocol.

In order to maintain maximum backwards compatibility, this ability is allowed. However, it can be disabled on a per-Dial Circuit basis with the **set send_line_id** command. This command has been used to disabling the Line ID protocol on outbound circuits; it is now, additionally, used to disable the protocol on inbound circuits as well. The wording of the displays for this command have been changed to reflect this:

Example:

```
Circuit Config>set send_line_id
Send/Receive Local ID (Both,Send_only,Receive_only,None) [BOTH]? none
Circuit Config>list
Base net:       2
Destination name:    remote
Inbound calls        allowed
Idle timer           = 0 (fixed circuit)
SelfTest Delay Timer = 150 ms
Send/Rcv Line ID:    NONE
Circuit Config>
```

The original settings of **yes** and **no** are still allowed, and map to **both** and **none** respectively. The settings of **send_only** and **receive_only** are used to restrict LID to outbound or inbound use respectively.

For maximum security, and to maintain your current connection abilities, you should review your Dial Circuit settings before upgrading to this version of the software.

If Calling Line Identification (or Caller ID) is not available, or inconsistently used in your area, you may wish to use the Local ID protocol to match callers to Dial Circuits, and depend on PPP security to prevent unauthorized access. Set the Send/Rcv Line ID parameter to **both**.

If you wish to only allow callers with a valid CLID to connect, you will wish to disable the Local ID protocol. Set the Send/Rcv Line ID paramter to **none**.

If CLID is not available to you, but is available at the site(s) you call, you may wish to set the parameter to **receive_only**. The protocol will be used to validate incoming callers, but will not be used when making outbound calls. Conversely, if you wish to use only CLID to identify incoming callers, but a site you call needs to use LID, set the parameter to **send_only**.

You may decide to have a mixture of circuits, some allowing Local ID and some not. Additionally, a circuit set to **any_inbound** will always allow connects, whether or not CLID and/or Local ID are present.

2.5 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 2–1 lists the Dial Circuit configuration commands.

Table 2–1 Dial Circuit Configuration Commands Summary

Command	Function
? (Help)	Lists the configuration commands or lists the options associated with that command.
Delete	Deletes the inbound call settings from the Dial Circuit configuration.
Encapsulator	Allows you to change the datalink protocol configuration.
List	Displays the Dial Circuit configuration parameters.
Profile-list	Displays telesaving profiles used for Call Blocking, Call Back and Initial Minimum Call Timer.
Set	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.
Exit	Exits the Dial Circuit configuration process and returns to the `Config>` prompt.

2.5 Dial Circuit Configuration Commands

? (Help)

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

Syntax: ?

Example:

```
?
DELETE
ENCAPSULATOR
LIST
PROFILE-LIST
SET
EXIT
```

Example:

```
Set ?
NET
CALLS
DESTINATION
INBOUND DESTINATION
ANY_INBOUND
IDLE
SELFTEST-DELAY
SEND_LINE_ID
INITIAL-MINIMUM-TIMER
BLOCKING
CALL-BACK
```

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 (`PPP Config>` prompt). You can change the protocol using the **set data-link** command at the `Config>` prompt.

2.5 Dial Circuit Configuration Commands

On a V.25 *bis* interface the datalink protocol may be PPP, Multilink PPP or PSL. On an ISDN interface the datalink protocol may be PPP, PSL, Frame Relay or X.25.

On a PPP-FR Dial pseudo device the datalink protocol must be PPP or Multilink PPP.

Syntax: encapsulator

Example:

```
encapsulator
Frame Relay user configuration
FR Config>
```

Be aware of the following when you configure PSL or PPP on a V.25 *bis* interface:

- 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:       1
Destination name:    pppfrdest
Inbound dst name:    pppfrlocal
Outbound calls       allowed
Idle timer           = 0 (fixed circuit)
SelfTest Delay Timer = 150 ms
Send Line ID:        YES
Require matching rates:       Yes
Committed Information Rate:   64000
Committed Burst Size:         64000
Excess Burst Size:            0
```

2.5 Dial Circuit Configuration Commands

```
Profile(s) configured:
----------------------
    type: Initial Minimum Call Timer  name: INIT1
    type: Call Blocking  name: DEFAULT
    type: Call-Back   name: DEFAULT
```

Base net:	Name of the 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.
Inbound dst name	When `* ANY *` appears, the circuit is configured to accept inbound calls that do not match any other addresses. When configured to a name, this is used as an alternate comparison address name by the caller-ID mechanism for inbound calls.
Outbound calls	Displays this parameter when the circuit is configured to initiate outbound calls.
Inbound calls	Displays this parameter when the circuit is configured to accept inbound calls.
Idle timer	Displays the idle timer setting in seconds. The range is 0 to 65535; 0 indicates that this is a dedicated circuit (leased line). The Idle timer is always 0 for Frame Relay Dial Circuits.
SelfTest Delay Timer	Displays the self-test delay timer setting in milliseconds. The range is 0 to 65535; 0 indicates no delay.
Send Line ID	Indicates whether proprietary local id messages are sent.
Committed Information Rate	Displays the committed information rate (CIR) that will be requested in an outbound call or that will be expected in an inbound call. The range is 300 bps to 2048000 bps. The default is 64 Kbps. This is only displayed if the *Base net* is a Frame Relay interface.
Committed Burst Size (Bc)	Defines the maximum amount of committed data that the Frame Relay SVC can transmit. This value will be requested in an outbound call or will be expected in an inbound call. The range is 300 bps to 2048000 bps. The default is 64 Kbps. This is only displayed if the *Base net* is a Frame Relay interface.

Excess Burst Size (Be) — Defines the maximum allowed amount of uncommitted data for the Frame Relay SVC. This value will be requested in an outbound call or will be expected in an inbound call.

The range is 0 bps to 2048000 bps. The default is 0 bps.

This is only displayed if the *Base net* is a Frame Relay interface.

Profiles configured — Displays the three telesaving profiles configured for use by this Dial Circuit.

Type — Identifies the type of telesaving profile:

Initial Minimum Timer

Call-Back or

Call Blocking

Name — Displays the name of the telesaving profile configured for use by this Dial Circuit. The default profile in all cases is DEFAULT.

Profile-list

Displays the three telesaving profiles if they have been configured on the router. This command can be used to display the profile definitions that are available, before using the **set** command to configure the Dial Circuit with selected profiles.

Refer to Chapter 14 for details about configuring telesaving profiles using the Telesaving feature.

Syntax: profile-list

blocking
call-back
initial-minimum-timer

blocking

Displays the call blocking telesaving profiles.

Example:

```
profile-list blocking
LIST profile(s) - BLOCKING                    * = current active action
Enter profile name, or ALL (1 to 15 characters):   []? all
========================================================================
Type                     Name             Default Blocking
----                     ----             ----------------
BLOCKING                 DEFAULT         *Action :- NONE
                                          Clear Active Calls :- DISABLE
```

```
No bands defined

========================================================================
Type                     Name               Default Blocking
----                     ----               ----------------
BLOCKING                 CBLK01             Action :- BOTH
                                            Clear Active Calls :- ENABLE

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
 1    MONDAY     FRIDAY      00:00       24:00     BOTH
*2    MONDAY     FRIDAY      08:00       18:00     NONE

*** End of profile listing ***
```

List profile(s) BLOCKING. This is a call-blocking profile.

Enter profile name Specify the name of the call blocking profile you want to list, or **ALL** to display all call blocking profiles.

Type Indicates the type of profile being displayed. BLOCKING indicates that this is a call-blocking profile.

Name Indicates the name used to identify this profile. The name has 1 to 15 characters.

Default Blocking

Action The default call blocking action which is used if none of the configured bands apply.

None – Allow incoming and outgoing calls.

Incoming – Do not accept incoming calls.

Outgoing – Do not allow outgoing calls.

Both – Do not allow incoming or outgoing calls.

The asterisk (*) indicates that this is the currently active action.

Clear Active Calls Indicates whether active calls will be cleared when this band becomes active.

Enable – Active calls, in the direction specified by *Action*, will be cleared when this band becomes active.

Disable – Active calls will not be cleared when this band becomes active.

Band — Indicates the sequence number of the timeband defined within each profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number.

The asterisk (*) indicates that this is the currently active band.

Start Day — Indicates the day of the week on which this timeband begins.

End Day — Indicates the day of the week on which this timeband ends.

Start Time — Indicates the time of day at which this timeband begins. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.

End Time — Indicates the time of day at which this timeband ends. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.

Action — Indicates the call blocking action which is used when this timeband is active.

None – Allow incoming and outgoing calls.

Incoming – Do not accept incoming calls.

Outgoing – Do not allow outgoing calls.

Both – Do not allow incoming or outgoing calls.

call-back

Displays the call-back telesaving profiles.

Example:

```
profile-list call-back
LIST profile(s) - CALL-BACK                    * = current active action
Enter profile name, or ALL (1 to 15 characters):   []? clb01
========================================================================
Type                     Name                Default Call-Back
----                     ----                -----------------
CALL-BACK                CLB01               Action :- NONE
                                             Delay ms 1000
                                             Wait seconds 20
```

```
Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
 1    MONDAY     FRIDAY      00:00       24:00     REQUEST
*2    MONDAY     FRIDAY      08:00       18:00     ACCEPT

*** End of profile listing ***
```

List profile(s) CALL-BACK. This is a call-back telesaving profile.

Enter profile name Specify the name of the call-back profile you want to list, or **ALL** to display all call-back profiles.

Type Indicates the type of profile being displayed. CALL-BACK indicates that this is a call-back profile.

Name Indicates the name used to identify this profile. The name has 1 to 15 characters.

Default Call-Back

Action The default call-back action which is used if none of the configured bands apply.

None – Do not use call-back.

Accept – Call-back the remote station when monitoring incoming calls.

Request – Request call-back from remote station on outgoing calls.

The asterisk (*) indicates that this is the currently active action.

Accept Delay Indicates the the default interval, in milliseconds, that the acceptor waits before redialing when calling back to the remote station.

The range is 100 milliseconds to 5000 milliseconds, and the default value is 1000 milliseconds.

Wait Indicates the default interval, in seconds, that the Receiver waits for a remote station to respond to an outgoing call which requests call-back.

The range is 5 to 120 seconds and the default value is 20 seconds.

Band Indicates the sequence number of the timeband defined within each profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number.

The asterisk (*) indicates that this is the currently active band.

Start Day	Indicates the day of the week on which this timeband begins.
End Day	Indicates the day of the week on which this timeband ends.
Start Time	Indicates the time of day at which this timeband begins. The format is *hh:mm,* where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.
End Time	Indicates the time of day at which this timeband ends. The format is *hh:mm,* where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.
Action	Indicates the call-back action which is used when this timeband is active. **None –** Do not use call-back. **Accept** – Call-back the remote station when accepting incoming calls. **Request –** Request call-back from remote station on outgoing calls.
List profile(s)	CALL-BACK. This is a call-back telesaving profile.

initial-minimum-timer

Displays the initial minimum timer telesaving profiles.

Example:

```
profile-list initial-minimum-timer
LIST profile(s)-INITIAL-MINIMUM-TIMER     * = current active timer
Enter profile name, or ALL (1 to 15 characters):   []? all
=======================================================================
Type                      Name                Default Timer(secs)
----                      ----                -------------------
INITIAL-MINIMUM-TIMER     DEFAULT             00090

Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
 1    MONDAY     FRIDAY      00:00       24:00     00050
*2    MONDAY     FRIDAY      08:00       18:00     00030
========================================================================
Type                      Name                Default Timer(secs)
----                      ----                -------------------
INITIAL-MINIMUM-TIMER     IMCT01              00120
```

```
Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
 1    MONDAY     FRIDAY      00:00       24:00     00090
*2    MONDAY     FRIDAY      08:00       18:00     00060

*** End of profile listing ***
```

List profile(s) — INITIAL-MINIMUM-TIMER. This is an initial minimum timer profile.

Enter profile name — Specify the name of the initial minimum timer profile you want to list, or **ALL** to display all initial minimum timer profiles.

Type — Indicates the type of profile being displayed. INITIAL-MINIMUM-TIMER indicates that this is an initial minimum timer profile.

Name — Indicates the name used to identify this profile. The name has 1 to 15 characters.

Default Timer — Indicates the default minimum time, in seconds, that calls will be connected. This timer is used when no other timeband in the profile is active.

Band — Indicates the sequence number of each timeband in the profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number.

The asterisk (*) indicates that this is the currently active band.

Start Day — Indicates the day of the week on which this timeband begins.

End Day — Indicates the day of the week on which this timeband ends.

Start Time — Indicates the time of day at which this timeband begins. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.

End Time — Indicates the time of day at which this timeband ends. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.

Timer — Indicates the minimum time, in seconds, that calls will be connected when this timeband is active.

2.5 Dial Circuit Configuration Commands

Set

Map the Dial Circuit to a serial line interface; configure the Dial Circuit for inbound and/or outbound calls; set destination addresses, inbound addresses, idle timeout, and self-test delay and configure the circuit to use specified telesaving profiles.

Syntax: set

net...
calls...
destination...
inbound destination...
any_inbound
idle...
selftest-delay...
send_line_id...
blocking
call-back
initial-minimum-timer

net ***# of interface***

Specifies the number of the serial line, ISDN or Frame Relay interface to which you want to map this circuit.

Example:

```
set net 2
```

If you are mapping a PPP-FR Dial Circuit to an SVC on a Frame Relay network interface the command prompts for additional Frame Relay data rate parameters:

Example:

```
set net 1
Require matching information rates? [Yes]:
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc)in bits [64000]?
Excess Burst Size (Be) in bits [0]?
```

2.5 Dial Circuit Configuration Commands

Require matching information rates	Controls whether this circuit will require specific information rates (CIR, Bc, Be) on incoming and outgoing calls. If set to **Yes** then: **incoming** Frame Relay SVC calls will only be accepted if the information rates proposed are the same as the rates configured for this SVC. **outgoing** calls will request the information rates you specify, and will only accept the call connection if the remote station confirms the same rates. The default is **Yes**.
Committed Information Rate	Defines the committed information rate (CIR) that will be requested in an outbound call or that will be expected in an inbound call when running with *Accept network default information rates* set to **No**. The range is 300 bps to 2048000 bps. The default is 64 Kbps.
Committed Burst Size (Bc)	Defines the maximum amount of committed data that the Framer Relay SVC can transmit. This value will be requested in an outbound call or will be expected in an inbound call when running with *Accept network default information rates* set to **No**. The range is 300 bps to 2048000 bps. The default is 64 Kbps.
Excess Burst Size (Be)	Defines the maximum allowed amount of uncommitted data for the Frame Relay SVC. This value will be requested in an outbound call or will be expected in an inbound call when running with *Accept network default information rates* set to **No**. The range is 0 bps to 2048000 bps. The default is 0 bps.

2.5 Dial Circuit Configuration Commands

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 a remote address name that you assigned at the `Config>` prompt using the:

- **add v25-bis-address** command for V.25 *bis* interfaces
- **add isdn-address** command for ISDN interfaces
- **add frame-relay-address** command for Frame Relay SVCs used by PPP-FR Dial pseudo devices

Note: This parameter is not required for V.25 *bis* interfaces operating in DTR dialing mode. The modem must be configured to automatically dial the remote address.

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 the local address name that you assigned at the `Config>` prompt using the:

- **add v25-bis-address** command for V.25 *bis* interfaces
- **add isdn-address** command for ISDN interfaces

2.5 Dial Circuit Configuration Commands

- **add frame-relay-address** command for Frame Relay SVCs used by PPP-FR Dial pseudo devices.

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
```

Note: **Frame Relay Dial Circuits** – the idle timer must be 0. If you try to set the idle timer on a Frame Relay Dial Circuit you will get an error message:

Example:

```
set idle 60
Frame Relay Dial Circuits can only be fixed circuits (idle timer = 0)
```

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.

send_line_id ***both/yes*** *or* ***send_only*** *or* ***receive_only*** *or* ***none/no***

Specifies whether proprietary or local Caller ID or Line ID messages are sent. Options are **Both** (or **Yes**), **Send_only**, **Receive_only** or **None** (or **No**). The default is **Both**. For V.25 *bis* Dial Circuits you should set this option to **Both**.

See Section 2.4 for a discussion of the use of this command to control call acceptance based on Caller ID or Line ID.

Example:

```
set send_line_id
Send/Receive Local ID (Both,Send_only,Receive_only,None) [BOTH]? none
```

blocking

Specifies the call blocking profile that this Dial Circuit will use.

Refer to Chapter 14 for details about configuring telesaving profiles using the Telesaving feature.

Example:

```
set blocking
Enter profile name, or NONE (1 to 15 characters):   [DEFAULT]?
```

call-back

Specifies the call-back profile that this Dial Circuit will use.

Refer to Chapter 14 for details about configuring telesaving profiles using the Telesaving feature.

Example:

```
set call-back
Enter profile name, or NONE (1 to 15 characters):   [DEFAULT]?
```

initial-minimum-timer

Specifies the initial-minimum-timer profile that this Dial Circuit will use.

Refer to Chapter 14 for details about configuring telesaving profiles using the Telesaving feature.

Example:

```
set initial-minimum-timer
Enter profile name, or NONE (1 to 15 characters):   [DEFAULT]?
```

Exit

Return to the `Config>` prompt.

Syntax: exit

Example:

```
exit
```

2.6 Dial Circuits and the GWCON Interface Command

While Dial Circuits 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.

```
+ interface
                                          Self-Test  Self-Test  Maintenance
Nt Nt' Interface       CSR  Vec      Passed     Failed       Failed
0  0   Eth/0     80000000   44            1          0            0
1  1   V25/0     80001000   48            1          0            0
2  1   PPP/0     80001000   48            0          1            0
3  1   PPP/1     80001000   48            0          1            0

+
```

Nt Global network number.

Nt' Base network on which this circuit is configured. The previous output indicates the following:

Nt 0 is a standard Ethernet network.

Nt 1 is the network interface on which the base V.25 *bis* device is configured.

Nt 2 and **Nt 3** are V.25 *bis* Dial Circuits configured for PPP. This is indicated because the `Nt'` number is identical to the number in the `Nt` field for the base V.25 *bis* interface (**Nt 1**). Also, the `CSR` and `Vec` fields are identical to Nt 1. Refer to the highlighted fields in the following extract:

```
Nt Nt' Interface       CSR  Vec
0  0   Eth/0     80000000   44
1  1   V25/0     80001000   48
2  1   PPP/0     80001000   48
3  1   PPP/1     80001000   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.

3

Configuring and Monitoring the Ethernet Network Interface

This chapter describes how to configure and monitor the Ethernet interface.

3.1 Accessing the Interface Configuration and Console Processes

For information about accessing the configuration and console processes, 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.

Enter configuration commands at the `ETH config>` prompt.

Enter console (monitoring) commands at the `ETH>` prompt.

3.2 Ethernet Configuration and Console Commands

Table 3–1 summarizes the Ethernet configuration and console commands. The sections that follow explain these commands.

Note: Refer to the hardware documentation for specifics about your router type. Some commands may not apply for your hardware platform.

3.2 Ethernet Configuration and Console Commands

Table 3–1 Ethernet Configuration and Console Command Summary

Command	Task	Function
? (Help)	Configure/ Monitor	Displays all the Ethernet commands or lists subcommand options for specific commands.
Collisons	Monitor	Displays a collisions statistic for the specified Ethernet interface.
Connector-Type	Configure	Sets the connector type.
IP-Encapsulation	Configure	Sets the IP encapsulation as Ethernet type 8137 or Ethernet 802.3.
List	Configure	Displays the connector type, Ethernet version number, NetWare IPX encapsulation, and IP encapsulation.
LLC	Configure/ Monitor	Accesses the LLC configuration or monitoring process and displays the LLC> prompt.
Frame	Configure	Sets the NetWare IPX encapsulation as Ethernet type 8137, Ethernet 802.3, Ethernet 802.2, or Ethernet SNAP.
Exit	Configure/ Monitor	Exits the config and monitor processes and returns to the previous prompt level.

? (Help) C M

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
LLC
FRAME
VERSION
EXIT
```

Example:

```
ETH> ?
COLLISIONS
LLC
EXIT
```

3.2 Ethernet Configuration and Console Commands

Collisions M

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:

```
collisions
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
```

Connector-Type C

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.

3.2 Ethernet Configuration and Console Commands

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 **C**

Set the NetWare IPX encapsulation type. Refer to Table 3–2 and enter one of the following:

Table 3–2 NetWare IPX Encapsulation Types

Option	Description	Syntax
Ethernet_II (Ethernet type 8137)	Uses Ethernet type 8137 as the packet format. This format is required if you are using NetWare IPX on the Ethernet.	frame ethernet_II
Ethernet_8023 (IEEE 802.3 'raw' 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
```

3.2 Ethernet Configuration and Console Commands

IP-Encapsulation **C**

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 **C**

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
```

LLC **C M**

Access the LLC prompt. LLC commands are entered at the `LLC Config> or LLC>` prompt. See Chapter 7 for an explanation of each of these commands.

Syntax: llc

Example:

```
ETH_Config>llc
LLC user configuration
LLC Config>
```

Example:

```
ETH>llc
LLC user monitoring
LLC>
```

Exit **C M**

Return to the previous prompt level.

Syntax: exit

Example:

```
exit
```

3.3 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
                                        Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec     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
                                        Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec     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
```

3.3 Displaying Ethernet Statistics Through the Interface Command

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.

Nt	Global interface number.
Nt'	Reserved for Dial Circuit use
Interface	Interface name and its instance number.
CSR	Command and Status Register address.
Vec	Interrupt vector.
Self-Test Passed	Number of times self-test succeeded (state of interface changes from down to up).
Self-Test Failed	Number of times self-test failed (state of interface changes from up to down).
Maintenance Failed	Number of maintenance failures.
Physical address	The ethernet address of the device currently in use. This may be the PROM address or an address overwritten by another protocol.
PROM address	The permanent unique Ethernet address in the PROM for this Ethernet interface.
Interface type	This output specifies the connector type as AUI, BNC, or RJ45.

3.3 Displaying Ethernet Statistics Through the Interface Command

Input statistics:

failed, packet too long or failed, frame too long	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.
failed, framing error or failed, alignment error	The Failed, Framing Error counter increments when the interface receives a packet whose length in bits is not a multiple of eight.
failed, FIFO over-run or failed, FIFO overrun	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.
collision in packet	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.
short frame	The counter increments when the interface receives a packet with a short frame.
buffer full warnings	The Buffer Full Warnings counter increments each time the local packet buffer is full.
packets missed	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.
internal mac rx errors	Receive errors that are not late, excessive, or carrier check collisions. This data is exported through SNMP as the `dot3StatsInternalMacReceiveErrors` counter.

Input statistics:

Internal mac rx errors	Receive errors that are not late, excessive, or carrier check collisions. This data is exported through SNMP as the `dot3StatsInternalMacReceiveErrors` counter.

3.3 Displaying Ethernet Statistics Through the Interface Command

Output statistics:

initially deferred or deferred transmission	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.
single collision	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.
multiple collisions	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.
total collisions	The Total Collisions counter increments by the number of collisions a packet incurs.
failed, excess collisions	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.
failed, FIFO under-run	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.
failed, carrier check or failed, carrier sense error	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.
CD heartbeat error or SQE test error	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.

3.3 Displaying Ethernet Statistics Through the Interface Command

out of window collisions or ate collisions	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 `dot3StatsLateCollisions` counter.
internal mac tx errors or internal MAC trans errors	Transmit errors that are not late, excessive, or carrier check collisions. This data is exported through SNMP as the `dot3StatsInternalMacTransmitErrors` counter.
RISC Microcode Version	This gives the version of the microcode running in the RISC controller of the communications processor module.

4

Configuring and Monitoring the FDDI Network Interface

This chapter describes the commands that configure the FDDI network interface. Since FDDI does not include a console process for monitoring the interface, the chapter also describes how to use the GWCON interface command.

4.1 Accessing the Interface Configuration Processes

For information about accessing the configuration process, 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.

4.2 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, refer to the GWCON chapter in the *System Software Guide*. Information about displaying statistics for FDDI interfaces is included in this chapter.

4.3 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.

4.4 FDDI Configuration Commands

- 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.

4.4 FDDI Configuration Commands

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

Table 4–1 FDDI Configuration Command Summary

Command	Function
? (Help)	Displays all the FDDI commands or lists subcommand options for specific commands.
Frame	Sets the NetWare IPX encapsulation type.
List	Displays FDDI software configurable information such as buffer allocation, timer settings, station types, and connection policies.
Set	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.
Exit	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
```

4.4 FDDI Configuration Commands

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
FDDI using 802.2	Uses the standard 802.2 DSAP/SSAP of E0 for IPX.	frame fddi
FDDI using 802.2 with SNAP	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-I-OUI
- config
- max-trt
- phy . . .
- policy
- req-trt
- smt-timer
- station-type
- tvx-timer

4.4 FDDI Configuration Commands

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
```

4.4 FDDI Configuration Commands

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 to 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.

Ring Type	Defines the ring (a or b) that you want to monitor.

4.4 FDDI Configuration Commands

Parameter	Defines the variable that you want to set. The two variables are *alarm* and *cutoff*.
Value	Sets the alarm and cutoff link error rates.
Alarm value	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.
Cutoff value	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.

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
```

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:

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
```

4.4 FDDI Configuration Commands

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*.

Peer	Refers to a single MAC, dual attach topology. The station attaches to main FDDI ring.
Slave	Refers to a single MAC, single attach topology. The station attaches to an FDDI concentrator.

Example:

```
set station-type peer
```

tvx-timer ***#-of-bye-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
```

4.5 Statistics Displayed For the FDDI Interface

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, refer to the GWCON chapter in the *System Software Guide*.

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

```
+int 0
                                Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec     Passed     Failed       Failed
0  0   FDDI/0           0    0          1          0            0

FDDI/IEEE 802.2 MAC/data-link on FDDI interface
UNA: 08002BA34EE8 -> MLA: 08002BB1E5E8 -> DNA: 08002BA34EE8
Policy = reject A-A B-B M-M
Connection:  AB_FRONT
T_Neg = 0x18600 = 7.987200 msec,   Latency = 0.000000 msec
TVX = 2.621440              T_Max = 167.772160       T_Req = 7.987200 msec
PHYA state:active            PHYB state:connecting
ECM:In                       CFM:c_wrap_a             RMT:Ring_Op
ringinits:0
My bcn:0                     Other beacon:0           Trace rcv:0, xmt:0
PHYA: LEM Alarms:0           LCT Fails:0              LEM Ct:0
          Alarm:10^-8        Cutoff:10^-8             Estimate:10^-15
PHYB: LEM Alarms:0           LCT Fails:0              LEM Ct:0
          Alarm:10^-8        Cutoff:10^-8             Estimate:10^-15
T_Notify: 10 sec
Frames:0                     Errors:0                 Losts:0
Xmts:0                       Xmts failed:0            Xmt underruns:0
Copied:0                     Rcv overruns:0           Rcv no buffer: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.

4.5 Statistics Displayed For the FDDI Interface

```
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:

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

ALS	Active line state.
HLS	Halt line state.
ILS	Idle line state.
MLS	Master line state.

NLS Noise line state.

NSD No signal detect.

QLS 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:

ECM Displays the entity connection management state. This is the software controlling the bypass switch.

CFM Displays the configuration management state.

RMT Specifies the ring management software monitoring the state of the ring.

Noise Displays the number of times a noise byte occurred on the PHY A and PHY B connections.

Status Displays the last time the ring became operational.

Ringinits Displays the number of times initialization of the ring occurred.

TVX expired Displays the number of times the valid transmission timer expired. See the **set TVX-timer** command.

TRT expired Displays the number of times the target rotation timer expired.

```
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 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.

4.5 Statistics Displayed For the FDDI Interface

```
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:

Alarms	Displays the acceptable link error rate and the number of times the link error rate exceeded this value for each interface connection. See the **set phy** alarm command.
Cutoff	Displays the number of times cutoffs occurred. See the **set phy** cutoff command.
LCT fails	Displays the number of times the link confidence test failed.
LEM count	Displays the total number of link error events that occurred.
Estimate	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:

T_notify	Displays how often the interface generates NIF frames to neighbor nodes. See the **set notify-timer** command.
SMT frames	Displays the number of SMT frames received and generated by the interface.

```
Frame:57439. Errors:3, Losts:0, Xmts:1028, Copied1291, 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.

5

Configuring and Monitoring Frame Relay Network Interfaces

This chapter describes how to configure and monitor PVCs and SVCs on Frame Relay interfaces.

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

5.1 Accessing the Interface Configuration and Console Processses

For information about accessing the configuration and console processes, 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.

Enter configuration commands at the `FR config>` prompt.

Enter console (monitoring) commands at the `FR>` prompt.

Refer to Chapter 2 for details about configuring and monitoring Frame Relay Dial Circuits over ISDN network interfaces.

5.2 Frame Relay PVCs Basic Configuration Procedure

This section outlines the minimum configuration steps that are required to get the Frame Relay PVCs up and running. If you desire any further configuration information and explanation, refer to the configuration commands described in this chapter.

5.3 Frame Relay SVCs Basic Configuration Procedure

To configure Frame Relay PVCs, 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: 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 standard FR PVCs on 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.

Note: Do not configure IP addresses on PVCs created for use by PPP over Frame Relay. Use the PPP-FR configuration process to configure these devices.

5.3 Frame Relay SVCs Basic Configuration Procedure

This section outlines the minimum configuration steps that are required to get Frame Relay SVCs up and running. If you desire any further configuration information and explanation, refer to the configuration commands described in this chapter.

To configure Frame Relay SVCs, 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. For example to set interface 1 to Frame Relay enter the following:

   ```
   Config>set datalink frame-relay 1
   Config>
   ```

2. **Add Frame Relay network addresses**, entering the name and number at the prompts for both local and remote routers.

```
Config>add frame-relay-address locaddrname locdialaddr
Config>add frame-relay-address remaddrname remdialaddr
Config>
```

3. **Configure SVCs**. Add and configure any SVCs that are needed. Use the **svc** command from the `FR Config>` prompt to reach the `FR SVC Config>` prompt.

```
FR Config>svc
FR SVC Config>
```

4. **Configure Frame Relay SVC local addresses**. Use the **set local-address** command from the `FR SVC Config>` prompt to set the local address mapping. Use the local address you defined in step 2.

```
FR SVC Config>set local-address locaddrname
FR SVC Config>
```

5. **Add RFC1490 Frame Relay SVCs**. Use the **add svc** command from the `FR SVC Config>` prompt to add Frame Relay SVCs which will be used for inbound or outbound calls. Use one of the remote addresses which you defined in step 2 for each SVC.

Note: Do not use the **add svc** command to add SVCs for use by PPP encapsulation over Frame Relay. These SVCs are added when the PPP-FR Dial pseudo device is configured.

```
FR SVC Config>add svc
Frame Relay destination address?  remaddrname
Idle timer? [60]:
Recall timer? [15]:
Max recalls? [30]:
Call direction (In/Out/Both)? [BOTH]
Allow broadcast traffic? [Yes]
Require matching information rates? [Yes]
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc)in bits [64000]?
Excess Burst Size (Be) in bits [0]?
Assigned circuit name? []:
FR SVC Config>
```

6. **Add protocol addresses**. Use the **add protocol-address** command from the `FR SVC Config>` prompt to add protocol addresses for each outbound SVC created in step 5.

Note: Do not use the **add protocol-address** command on SVCs for use by PPP encapsulation over Frame Relay.

```
FR SVC Config>add protocol address
Frame Relay destination address?  remaddrname
Protocol? [IP]
Protocol Address? remnetaddr
```

7. **Enable SVCs**. When you have configured all the SVCs, use the **enable interface** command to globally enable Frame Relay SVC activity on this interface and then return to the `FR Config>` prompt.

```
FR SVC Config>enable interface
FR SVC Config>exit
FR Config>
```

If you want to encapsulate PPP over Frame Relay SVCs you will need to add a PPP-FR Dial pseudo device and configure it. Refer to Chapter 8, Configuring and Monitoring Point-to-Point Protocol Network Interfaces, and Chapter 2, Configuring and Monitoring Dial Circuits, for the procedures and commands to configure a PPP-FR Dial pseudo device.

5.4 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 Table 5–1 for details of the management types available.

The options available under the **set** command for enabling Frame Relay management are listed in Table 5–1 and an example of how to set these management modes is shown below it. Refer to the **Enable** and **Set** commands in this chapter for more information.

Table 5–1 Frame Relay Set Commands Options

Command	Options	Description	Default
set	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
```

5.5 Frame Relay Configuration and Console Commands

The Frame Relay configuration commands allow you to create or modify a Frame Relay configuration. Frame Relay console commands let you monitor the status of the interface. This section summarizes and then explains the Frame Relay configuration and console commands. Defaults for any command and its parameters are enclosed in brackets immediately following the prompt.

Table 5–2 summarizes the Frame Relay configuration and console commands.

Table 5–2 Frame Relay Configuration and Console Command Summary

Command	Task	Function
? (Help)	Configure/ Monitor	Lists configuration commands and parameters, and console commands and options.
Add	Configure	Adds PVCs and destination protocol addresses to the Frame Relay interface.
Change	Configure	Changes PVCs that were added using the Add command.
Clear	Monitor	Clears statistical information on the Frame Relay interface.

5.5 Frame Relay Configuration and Console Commands

Table 5–2 Frame Relay Configuration and Console Command Summary

Command	Task	Function
Disable	Configure/ Monitor	Disables any enabled Frame Relay features.
Enable	Configure/ Monitor	Enables Frame Relay features such as, circuit monitoring, management options, multicast, protocol-broadcast, orphans and individual SVCs.
LAPF	Configure	AccessES the FR LAPF Config> prompt.
List	Configure/ Monitor	Displays the current configuration of the LMI and PVCs. Displays statistics specific to the datalink layer and Frame Relay management.
Remove	Configure	Deletes any previously added PVCs or protocol addresses.
Set	Configure/ Monitor	Configures the properties associated with Frame Relay parameters (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.
SVC	Configure	Accesses the FR SVC Config> prompt.
Exit	Configure/ Monitor	Exits the Frame Relay configuration and console processes and returns to the previous prompt level.

? (Help) C M

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
LAPF
LIST
REMOVE
SET
SVC
EXIT
```

Example:

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

Add C

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 (CIR)in bps [64000]?
Committed Burst Size (Bc) in bits [64000]?
Excess Burst Size (Be) in bits [0]?
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 64 Kbps.

Committed Burst (Bc)	Indicates the maximum amount of committed data that the PVC can transmit, in the range of 300 bps to 2048000 bps. The default is 64 Kbps.
Excess Burst (Be)	Indicates the maximum allowed amount of uncommitted data for the PVC in the range of 0 bps to 2048000 bps. The default is 0 bps.
Assign Circuit Name	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 *unassigned*.

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 8.

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

Adds statically configured destination addresses (*protocol-addresses*) for specified protocols (*protocol-name*) 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.

Note: Do *not* use this command to add a protocol to a circuit allocated to a PPP-FR pseudo device. For information about configuring PPP-FR pseudo devices refer to Chapter 8.

This command has different prompts for the *protocol-address*, depending on the type of protocol that you adding. AppleTalk Phase 2 protocol addresses have two parts (network number and node number), so the command issues two prompts. Possible prompts are listed in Table 5–3.

Example:

```
add protocol-address
Protocol name or number [0]?IP
IP Address [0.0.0.0]?
Circuit Number [16]?
```

Table 5–3 Protocol Address Prompts for the Add Command

Protocol	Address Prompt
IP	`IP Address [0.0.0.0]?`
DN	`Node address [0.0]?`
IPX	`Host Number (in hex) []?`
APL	`Node number (1-254) []?`
AP2	`Network number (1-65279) []?` `Node number (1-253) []?`

Protocol name or number Defines the name or number of the protocol used at the address you are adding. The supported protocol numbers and their names are:

```
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 Address 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.

Node number Defines the node number, in the range 1–254 for AppleTalk Phase 1 networks, or 1–253 for AppleTalk Phase 2 networks.

Network number Defines the AppleTalk Phase 2 network number, in the range 1–65279.

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

5.5 Frame Relay Configuration and Console Commands

Change Permanent-Virtual-Circuit C

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 (CIR) in bps [64000]?
Committed Burst Size (Bc) in bits [64000]?
Excess Burst Size (Be) in bits [0]?
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.
Committed Burst (Bc)	Indicates the maximum amount of committed data that the PVC can transmit, in the range of 300 bps to 2048000 bps. The default is 64000 bps.
Excess Burst (Be)	Indicates the maximum allowed amount of uncommitted data for the PVC in the range of 0 bps to 2048000 bps. The default is 0 bps.
Assign circuit Name	Indicates the ASCII character string designation for the circuit that you want to change.

Clear M

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
```

5.5 Frame Relay Configuration and Console Commands

Disable C M

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

From the `FR Config>` prompt the command options are:

Syntax: disable
- cir-monitor
- congestion-monitor
- dn-length-field
- lmi
- multicast-emulation
- orphan-circuits
- protocol-broadcast

From the `FR>` console prompt the command options are:

Syntax: disable
- cir-monitor
- congestion-monitor
- svc

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
```

congestion-monitor

Disables the congestion monitoring feature that checks for the BECN bit set on packets received and adjusts transmission rate accordingly. The default setting for this feature is enabled.

Example:

```
disable congestion-monitor
```

5.5 Frame Relay Configuration and Console Commands

dn-length-field

Disables the feature that controls whether a length field is included within DECnet packets sent over Frame Relay. The default for this parameter is disabled.

Example:

```
disable dn-length-field
```

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 with the same circuit number (for example, 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
```

svc *fr-destination-address*

Disables active SVCs. This command is only available from the console prompt, so changes made are not saved across a reboot.

If an SVC has a call in place when the disable command is issued, the call will be cleared. No further calls will be made or accepted on this SVC until it is re-enabled with the **enable svc** command.

Example:

```
disable svc
Frame Relay destination address ? frremote
```

Enable C M

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

From the `FR Config>` prompt the command options are:

Syntax: enable
- cir-monitor
- congestion-monitor
- dn-length-field
- lmi
- multicast-emulation
- orphan-circuits
- protocol-broadcast

From the `FR>` prompt the command options are:

Syntax: enable
- cir-monitor
- congestion-monitor
- svc

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
```

5.5 Frame Relay Configuration and Console Commands

congestion-monitor

When this feature is enabled the router will slow its transmission rate on the reception of a packet with the BECN bit set. It increases its transmission rate whilst incoming packets do not have the BECN bit set. The default setting for this feature is enabled.

Example:

```
enable congestion-monitor
```

dn-length-field

This feature controls whether a length field is included within DECnet packets sent over Frame Relay. Control of the inclusion of this field allows compatibility with other router vendors. The default for this parameter is disabled.

Example:

```
enable dn-length-field
```

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 Section 5.4, 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
```

5.5 Frame Relay Configuration and Console Commands

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
```

svc *fr-destination-address*

Enables SVCs. This command is only available from the console prompt, so changes made are not saved across a reboot.

This command should be used to re-start SVCs which have gone into the Failed state after making the maximum number of recalls without successfully establishing a connection.

Example:

```
enable svc
Frame Relay destination address ? frremote
```

Lapf C

Display the FR LAPF Config> prompt. Refer to Section 5.7, Frame Relay LAPF Configuration Commands,for details of the commands available at this prompt.

Syntax: lapf

Example:

```
lapf
Frame Relay LAPF user configuration
FR LAPF Config>
```

5.5 Frame Relay Configuration and Console Commands

List C

Display currently configured management and PVC information.

Syntax: list

all
hdlc
lmi
permanent-virtual-circuits
protocol-address

all

Displays the current configuration of the Frame Relay interface. The output display for this command is a combination of the **list hdlc**, **list lmi**, **list permanent-virtual-circuits** and **list protocol-address** commands.

Example:
list all

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

lmi

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

Example:

list lmi

```
                       Frame Relay Configuration

LMI enabled = Yes     LMI DLCI        = 1023
LMI type    = REV1    LMI Orphans OK  =  Yes

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

PVCs P1 Allowed        = 64    DECnet length field           =  No
Timer T1 seconds       = 10    Counter N1 increments         =   6
LMI N2 error threshold =  3    LMI N3 error threshold window =   4
```

LMI enabled	Indicates whether the management features are enabled on the Frame Relay interface, yes or no.
LMI DLCI	Indicates the management circuit number. This number reflects the LMI type, 0 for ANSI or 1023 for LMI.
LMI Type	Indicates the LMI type: one of the configured management modes: Rev1, ANSI, or CCITT.
LMI Orphans OK	Indicates if nonconfigured circuits are available for use, yes or no.

5.5 Frame Relay Configuration and Console Commands

Protocol Broadcast	Indicates whether protocols such as RIP may function over the Frame Relay interface, yes or no.
Congestion monitoring	Indicates if the router will monitor congestion and adjust transmission rate, yes or no.
Emulate multicast	Indicates whether the multicast emulation is enabled on each active PVC, yes or no.
CIR monitoring	Indicates whether the circuit monitoring feature that maintains the transmission rate at the CIR is enabled, yes or no.
PVCs P1 allowed	Indicates the number of allowable PVCs for use with this interface.
DECnet length field	Indicates whether a length field is included within DECnet packets, yes or no.
Timer T1 seconds	Indicates the frequency that the Frame Relay interface performs a sequence number exchange with management.
Counter N1 increments	Indicates the interval (in seconds) that the Frame Relay interface queries the management for complete PVC status enquiry.
LMI N2 error threshold	Indicates the amount of management event errors occurring within the N3 window causing a reset of the Frame Relay interface.
LMI N3 error threshold window	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 circuits allowable = 64
Total circuits configured  = 7

    Circuit      Circuit    Circuit    CIR       Burst    Excess  Mtchd
    Name         Number     Type       in bps    Size     Burst   Rates
--------------   -------    -------    ------    -----    -----   -----
Boston             16       Permanent  64000     64000    0         -
Unassigned         20       Permanent  64000     64000    0         -
MPPP Pseudo Net 2  333      Permanent  64000     64000    0         -
```

Maximum circuits allowable Indicates the number of virtual circuits that can exist for this interface. This number includes any PVCs that you added with the **add permanent-virtual-circuit** command and dynamically learned through the management interface.

Total circuits configured Indicates the total number of currently configured virtual circuits for this interface.

Circuit Name Indicates the ASCII designation of the configured PVC.

The Circuit Name of PVCs in use by PPP-FR pseudo interfaces is set to *PPP Pseudo Net #*. Similarly, the Circuit Name of PVCs in use by MPPP-FR pseudo interfaces is set to *MPPP Pseudo Net* , where. # indicates the interface number of the pseudo interface.

Circuit Number Indicates the number of a currently configured PVC.

Circuit Type Indicates the type of virtual circuit, *Permanent* or *Switched.* This command lists all the Permanent virtual circuits.

Committed Information Rate Indicates the information rate guaranteed over the interface.

Committed Burst (Bc) Indicates the maximum amount of committed data that the PVC can transmit, in the range of 300 bps to 2048000 bps.

Excess Burst (Be) — Indicates the maximum allowed amount of uncommitted data for the PVC in the range of 0 bps to 2048000 bps.

Mtchd Rates — Not applicable for PVCs.

protocol-addresses

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

Example:

```
list protocol-addresses
               Frame Relay Protocol Address Translations

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
```

Protocol Type — Displays the name of the protocol running over the interface.

Protocol Address — Displays the address of the protocol running over the interface.

Circuit Number — Displays the PVC that is handling the protocol.

List M

Display statistics specific to the datalink layer and the Frame Relay interface.

Syntax: list

all
call-control
circuit
lapf
lmi
permanent-virtual-circuit
svcs

all

Displays circuit, management, and virtual circuit statistics on the Frame Relay interface. The output display for this command is a combination of the **list call-control, list lapf, list lmi**, **list permanent-virtual-circuit** and **list svcs** commands.

Example:

```
list all
```

call-control

Displays statistical information about the SVC calls on this interface.

Example:

```
list call-control
Call Control Data:
-----------------
  Calls received:             1    Calls sent:         25
  Timeouts:                   0    Insufficient Mem:   0
  LAPF Establish Ind.:        1    LAPF Release Ind.:  173
  Cause Class 1 Bitmap:   %x0021    Cause Class 1 Count 31
  Cause Class 2 Bitmap:   %x0200    Cause Class 2 Count 3
  Cause Class 3 Bitmap:   %x0000    Cause Class 3 Count 0
  Cause Class 4 Bitmap:   %x0000    Cause Class 4 Count 0
  Cause Class 5 Bitmap:   %x0000    Cause Class 5 Count 0
  Cause Class 6 Bitmap:   %x0000    Cause Class 6 Count 0
  Cause Class 7 Bitmap:   %x0000    Cause Class 7 Count 0
```

Call Control Data

Calls received Indicates the number of inbound calls that have been received on this interface.

Calls sent	Indicates the number of ougoing calls that have been made on this interface.
Timeouts	Indicates the number of times an SVC protocol timer (T303, T305, T308 or T310) has timed out.
Insufficient Mem	Indicates the number of times the router has been unable to allocate a buffer for frame transmission.
LAPF Establish Ind	Indicates the number of times the datalink for this interface has been established.
LAPF Release Ind.	Indicates the number of times the datalink for this interface has been released.
Cause Class n Bitmap	Indicates which cause codes have been received within a particular class (where *n* indicates the class).
Cause Class n Count	Indicates the number of cause codes that have been received within a particular class.

There are seven Classes of cause code, each having 16 possible Values. The seven Cause Class Bitmaps in the above listing each consist of 16 bits, so each bit in a bitmap represents a cause value for that class. When a particular cause code is seen the corresponding bit in the bitmap is set, and the counter for that Cause Class is incremented. For example, the bitmap for Cause Class 1 is %x0021 so bits 0 and 5 are set, and the Cause Class 1 Count is 31. That means we have seen 31 Class 1 cause codes, consisting of Cause codes %x10 (Cause number 16 – "Normal, clearing") and %x15 (Cause number 21 – "Call rejected").

Refer to Appendix B for a full table of cause codes and their descriptions.

circuit ***vc#***

Displays detailed configuration and statistical information for the specified virtual circuit (*vc#*). This command can be used on configured PVCs and currently active SVCs.

Example:

For a PVC

`list circuit 16`

```
Circuit name = Boston

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
```

Example:

For an SVC

`list circuit 18`

```
Circuit name = FrSVC-Out

Circuit state        = S10_Active
Frames transmitted   =       346  Bytes transmitted   =     19376
Frames received      =       345  Bytes received      =     19320
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
```

Circuit name	Indicates the ASCII designation of the configured virtual circuit.
Circuit state	Indicates the state of the circuit: active, inactive, or congested. *Inactive* indicates waiting for management. *Active* indicates that data is being transferred. *Congested* indicates that data flow is being controlled.
Circuit is orphan	Indicates whether the PVC is a non-configured circuit learned through management. This is not applicable for SVCs.

5.5 Frame Relay Configuration and Console Commands

Frames/Bytes transmitted	Indicates how many frames and bytes this virtual circuit has transmitted.
Frames/Bytes received	Indicates how many frames and bytes that this virtual circuit has received.
Total FECNS	Indicates the number of times that this virtual circuit was notified of inbound or downstream congestion.
Total BECNS	Indicates the number of times that this virtual circuit was notified of outbound or upstream congestion.
Times congested	Indicates the number of times that this virtual circuit was congested.
Times inactive	Indicates the number of times that this virtual circuit was inoperable.
CIR in bits/sec	Indicates the information rate of the virtual circuit in the range of 300 bps to 2048000 bps.
Committed Burst (Bc)	Indicates the maximum amount of committed data that the virtual circuit can transmit, in the range of 300 bps to 2048000 bps.
Excess Burst (Be)	Indicates the maximum allowed amount of uncommitted data for the virtual circuit in the range of 0 bps to 2048000 bps.
Xmit Frames dropped	Indicates the number of frames that this virtual circuit has dropped.

lapf

Displays statistics relevant to the lower layer protocol (LAPF) on the Frame Relay interface.

Example:

```
list lapf
LAPF Status:
-----------
  State:           Running (7_0)
  Retransmit Timer (100ms):   15    Idle Timer (secs):          30
  Retransmit Count:            3    Transmit Window:             7
  Frame Size:               2048

  Bytes Received:           1573    Bytes Sent:               1482
  Frames Received:            72    Frames Sent:                72
  Frame Format Errors:         0    Insufficient Memory:         0
  Processing Errors:           1
```

State — Indicates the basic state of the link:

- **Disconnected** – No modem signals
- **Down** – Modem signals, no response from remote end
- **Starting** – SABME/UA processing
- **Stopping** – DISC/UA processing
- **Running** – Up and Running
- **Timeout Recovery** – Recovering from a timeout

The value in brackets is the internal state.

Retransmit Timer — The interval, in units of 100ms, before a frame will be retransmitted if no response is received.

Idle Timer — The interval, is seconds, at which keepalive messages are polled if the link is idle.

Retransmit Count — Indicates the number of times a frame will be retransmitted before the link is considered to be down.

Transmit Window — The maximum number of frames that can be transmitted before before an acknowledgement is received.

Frame Size — Indicates the maximum frame size that can be sent on the LAPF link. A value of 0 indicates that the maximum frame size will be based on the MTU setting for this interface, as shown by the **list hdlc** command at the `FR Config>` prompt.

5.5 Frame Relay Configuration and Console Commands

Bytes Received	Indicates the number of bytes received by this LAPF connection, including control and level 3 data.
Bytes Sent	Indicates the number of bytes sent on this LAPF connection, including control and level 3 data.
Frames Received	Indicates the number of frames received by this LAPF connection, including control and level 3 data.
Frames Sent	Indicates the number of frames sent on this LAPF connection, including control and level 3 data.
Frame Format Errors	The number of Frame Format errors (Overrun, Underrun or Invalid Address) which have occurred on received frames.
Insufficient Memory	The number of times the router was unable to allocate a buffer for control frame transmission.
Processing Errors	The number of errors on the link, for example Retry Count exceeded, N201 error or P/F bit error.

lmi

Displays statistics relevant to the logical management on the Frame Relay interface.

Example:

`list lmi`

```
Management Status:
------------------
LMI enabled   = Yes    LMI DLCI        = 1023
LMI type      = REV1   LMI Orphans OK  =  Yes
LMI sequence interval seconds                           =   10

Protocol broadcast   = Yes      Congestion monitoring         =  Yes
Emulate multicast    = Yes      CIR monitoring                =   No
PVCs allowed         = 64       Interface MTU bytes           = 2048
Line access rate bps = 1544000  DECnet length field           =   No
Timer T1 seconds     = 10       Counter N1 increments         =    6
LMI N2 threshold     =  3       LMI N3 error threshold window =    4

Current receive sequence  = 0
Current transmit sequence = 1
Total status enquiries    = 1   Total status responses       = 0
Total sequence requests   = 0   Total responses              = 0
```

```
PVC Status:
-----------
Total Allowed   = 64              Total configured = 7
Total Active    = 3               Total Congested  = 0
Total Left Net  = 0               Total Join Net   = 0
```

LMI enabled	Indicates if Frame Relay management is active, yes or no.
LMI DLCI	Indicates the management circuit number. This number is either 0 (ANSI default) or 1023 (interim LMI).
LMI type	Indicates the type of Frame Relay management being used, ANSI or LMI.
LMI orphans OK	Indicates if all non-configured circuits made known by management are available for use, yes or no.
LMI seq interval seconds	Indicates the interval that management uses when exchanging keep alive information with an end station.
Protocol broadcast	Indicates if protocols such as RIP are able to operate over the Frame Relay interface.
Congestion monitoring	Indicates if the router will monitor congestion and adjust transmission rate, yes or no.
Emulate multicast	Indicates whether the multicast emulation is enabled on each active PVC, yes or no.
CIR monitoring	Indicates whether the circuit monitoring feature that limits the router transmission rate is enabled, yes or no.
PVCs allowed	Indicates the number of allowable PVCs for use with this interface.
Interface MTU bytes	Indicates the size of user data contained in the Frame Relay frame.
Line access rate bps	Indicates the physical data rate of the Frame Relay interface.
DECnet length field	Indicates whether a length field is included within DECnet packets, yes or no.
Timer T1 seconds	Indicates the rate that the Frame Relay interface performs a sequence number exchange with management.

5.5 Frame Relay Configuration and Console Commands

LMI N2 threshold	Indicates the amount of management event errors that resets the Frame Relay interface.
LMI N3 error threshold window	Indicates the number of events that the management window monitors.
Counter N1 increments	Indicates the time when the Frame Relay interface queries the management for PVC status.
Current receive sequence	Indicates the current receive sequence number that the Frame Relay interface received from management.
Current transmit sequence	Indicates the current transmit sequence number that the Frame Relay interface sent to management.
Total status enquiries	Indicates the total number of inquiries that management made concerning the status of the Frame Relay interface.
Total status responses	Indicates the total number of responses that Frame Relay interface received from management in response to management status enquiries.
Total sequence requests	Indicates the total number of sequence number exchanges that the Frame Relay interface made with management.
Total sequence responses	Indicates the total number of sequence number responses received in response to management sequence number exchange.
PVC Status	
Total allowed	Indicates the number of allowable PVCs (including orphans) for use with this interface.
Total configured	Indicates the total number of currently configured PVCs for this interface.
Total active	Indicates the number of active PVCs on this interface.
Total congested	Indicates the number of PVCs that are throttled down because of congestion within the network.
Total left net	Indicates the total number of PVCs that are no longer on the network.
Total join net	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

              Circuit   Orphan    Type/     Frames     Frames
Circuit#        Name    Circuit   State  Transmitted  Received
    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.

5.5 Frame Relay Configuration and Console Commands

svcs

Displays general link layer statistics and configuration information for all active SVCs on the Frame Relay interface.

Example:

`list svcs`

```
Switched Virtual Circuits Status:
--------------------------------
  DLCI Circuit name       State  CIR   Bc    Be     Frames Tx  Frames Rx
    18 FrSVC-Out          S10    64000 64000 0            497        495
     - frpvc2             Failed 64000 64000 0              0          0
     - PPP Pseudo Net 3   Idle   64000 64000 0              0          0
  1007 MPPP Pseudo Net 4  S10    64000 64000 0         393518     393898
      S1  - Call Init  S3  - Out Call Proc  S10 - Active
      S11 - Disc Req   S19 - Rel Req
```

DLCI	Indicates the number of the SVC.
Circuit name	Indicates the ASCII designation of the SVC.
State	Indicates the state of the circuit: **S1** – Call Initializing **S3** – Outbound call Proceeding **S10** – Active **S11** – Disconnect requested **S19** – Release requested **Disabled** – management disabled **Down** – Frame relay interface is down **Failed** – Maximum recalls reached. SVC must be re-enabled to restart **Idle –** circuit currently idle **Recall –** recall timer currently running
CIR	Indicates the committed information rate of the SVC in the range of 300 bps to 2048000 bps.
Bc	Indicates the maximum amount of committed data that the SVC can transmit, in the range of 300 bps to 2048000 bps.
Be	Indicates the maximum allowed amount of uncommitted data for the SVC in the range of 0 bps to 2048000 bps.

Frames Tx	Indicates how many frames this SVC has transmitted.
Frames Rx	Indicates how many frames this SVC has received.

Remove C

Delete any PVC or protocol-address previously added using the **add** 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 ***protocol-name protocol-address circuit#***

Deletes any configured protocol addresses (static ARP entries). This parameter has different prompts for the protocol address depending on the type of protocol that you are removing. Possible prompts are listed in Table 5–4:

Table 5–4 Protocol Address Prompts for the Remove Command

Protocol	Address Prompt
IP	`IP Address [0.0.0.0]?`
DN	`Node address [0.0]?`
IPX	`Host Number (in hex)[]?`
APL	`Node number (in decimal) []?`
AP2	`Network number (in decimal) []?` `Node number (in decimal) []?`

Example:

```
remove protocol-address
Protocol name or number [IP]?
IP Address [0.0.0.0]?
Circuit Number [16]?
```

Protocol name or number	Defines the name or number of the protocol that you are deleting. The supported protocol numbers and their names are:

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 or XNS host.
Node number	Defines the node number, in the range 1–254 for AppleTalk Phase 1 networks, or 1–253 for AppleTalk Phase 2 networks.
Network number	Defines the AppleTalk Phase 2 network number, in the range 1–65279.
Circuit Number	Defines the PVC in the range of 16 to 1007 that the protocol runs over.

5.5 Frame Relay Configuration and Console Commands

Set **C**

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

encoding *
frame-size
idle . . . *
line-speed
lmi-type
n1-parameter
n2-parameter
n3-parameter
p1-parameter
t1-parameter
transmit delay . . .*

5.5 Frame Relay Configuration and Console Commands

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 datalink. Datalink 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 hexadecimal) between frames. The mark option puts the line in a marking state (OFF, 1) between frames.

Example:

```
set idle flag
```

line-speed

Sets the access rate for the line. Use this command to inform the router of the actual speed of the modem that the line is using. This information is required for the Congestion Monitoring function to operate correctly.

Note: This command does not affect the actual speed of the line.

Example:

```
set line-speed
Access rate in bps   [64000]?
```

Access rate in bps	Indicates the actual speed of the line to which the router is connected, in the range of 300 bps to 2048000 bps. The default is 64000 bps.

lmi-type ***management type***

Sets the management type for the interface. See Section 5.4, Enabling Frame Relay Management, for details about setting Frame Relay management. The default is type *Rev 1* enabled. Table 5–5 lists the Frame Relay set command options.

Table 5–5 Frame Relay Set Commands Options

Command	Options	Description	Default
set	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. *Count* is the interval in the range of 1 to 255. The default is 6.

Example:

```
set n1-parameter
Parameter N1 [6]?
```

5.5 Frame Relay Configuration and Console Commands

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 and SVCs 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 virtual circuits.

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
Parameter T1 [10]?
```

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
Transmit Delay Counter [0]?
```

Set M

Change the configuration of a permanent virtual circuit on the Frame Relay interface.

Note: Changes you make to the configuration are not maintained across restarts.

Syntax: set circuit

circuit

Changes the configuration of a permanent virtual circuit.

Example:

```
set circuit
Circuit Number [16]?
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc) in bits [64000]?
Excess Burst Size (Be) in bits [0]?
```

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.
Committed Burst (Bc)	Indicates the maximum amount of committed data that the PVC can transmit, in the range of 300 bps to 2048000 bps. The default is 64000 bps.

Excess Burst (Be)	Indicates the maximum allowed amount of uncommitted data for the PVC in the range of 0 bps to 2048000 bps. The default is 0 bps.

Svc C

Display the FR SVC Config> prompt. Refer to Section 5.6, Frame Relay SVC Configuration Commands,for details of the commands available at this prompt.

Syntax: svc

Example:

svc

```
Frame Relay SVC user configuration
FR SVC Config>
```

Exit C M

Return to the previous prompt level.

Syntax: exit

Example:

exit

5.6 Frame Relay SVC Configuration Commands

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

Table 5–6 summarizes the Frame Relay SVC configuration and console commands.

Table 5–6 Frame Relay SVC Configuration Command Summary

Command	Task	Function
? (Help)	Configure	Lists configuration commands and parameters.
Add	Configure	Adds a Frame Relay SVC.
Change	Configure	Change configuration parameters associated with an existing SVC.
Delete	Configure	Deletes a local address.
Disable	Configure	Disables individual Frame Relay SVCs or all SVC activity on the interface.
Enable	Configure	Enables individual Frame Relay SVCs or all SVC activity on the interface.
List	Configure	Displays the current configuration of the Frame Relay SVCs, including local address, timers and status.
Remove	Configure	Removes previously added SVCs or protocol addresses.
Set	Configure	Configures the properties associated with Frame Relay SVC parameters (local address, timers and maintenance mode).
Exit	Configure	Exits the Frame Relay SVC configuration process and returns to the previous prompt level.

5.6 Frame Relay SVC Configuration Commands

? (Help) C

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
REMOVE
SET
EXIT
```

Add C

Adds and configures a Frame Relay SVC or a destination protocol address supported by the Frame Relay interface.

Syntax: add

protocol-address

svc

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

Adds statically configured destination addresses (*protocol-addresses*) for specified protocols (*protocol-name*) to a Frame Relay SVC. This command defines which SVC must make a call in order to reach the destination protocol address.

Note: Do not use this command on SVCs for use by PPP-FR Dial Circuits.

Example:

```
add protocol-address
Frame Relay destination address []?
Protocol? [IP]
IP Address [0.0.0.0]?
```

This command has different prompts for the *protocol-address*, depending on the type of protocol that you adding. AppleTalk Phase 2 protocol addresses have two parts (network number and node number), so the command issues two prompts. Possible prompts are listed in Table 5–7.

Table 5–7 Protocol Address Prompts for the Add Command (SVC)

Protocol	Address Prompt
IP	`IP Address [0.0.0.0]?`
DN	`Node address [0.0]?`
IPX	`Host Number (in hex) []?`
APL	`Node number (1-254) []?`
AP2	`Network number (1-65279) []?` `Node number (1-253) []?`

Frame Relay destination address Defines the network address name of the Frame Relay port at the remote router.

This address name must be one of the names already defined at the `Config>` prompt using the **add frame-relay address** command and assigned to an SVC previously added using the **add svc** command at the `FR SVC Config>` prompt. This field is used to map the protocol address entry to the correct SVC

Protocol Defines the name or number of the protocol that you are defining. Enter a ? to see a list of supported protocols

Example:

```
add protocol-address
Frame Relay destination address []?fdest
Protocol? [IP] ?
IP
DN
IPX
APL
AP2
Protocol name or number [IP]?
```

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

Node Address 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 or XNS host.

Node number Defines the node number, in the range 1–254 for AppleTalk Phase 1 networks, or 1–253 for AppleTalk Phase 2 networks.

5.6 Frame Relay SVC Configuration Commands

Network number	Defines the AppleTalk Phase 2 network number, in the range 1–65279.

svc

Adds a Frame Relay SVC, and configures timers and parameters. Each SVC which is being used for direct forwarding over the Frame Relay interface must be configured using this command.

Note: Do *not* use the **add svc** command to create an SVC for use by a PPP-FR Dial pseudo device. A Frame Relay SVC is created for this purpose when you use the **set net** command from the `Circuit config>` prompt for the PPP-FR Dial Circuit.. For information about configuring PPP-FR Dial pseudo devices refer to Chapter 8.

Example:

add svc

```
Frame Relay destination address?  router1
Idle timer? [60]:
Recall timer? [15]:
Maximum recalls? [30]:
Call direction (In/Out/Both)? [BOTH]
Allow broadcast traffic? [Yes]
Require matching information rates? [Yes]:
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc)in bits [64000]?
Excess Burst Size (Be) in bits [0]?
Assign circuit name []?
```

Frame Relay destination address	Defines the network address name of the Frame Relay port at the remote router. This field uniquely identifies this SVC. This address name must be one of the names already defined at the `Config>` prompt using the **add frame-relay address** command.
Idle timer	The default is 60 seconds.
Recall timer	Defines the wait time before a new call can be made if an outbound call is not accepted. The default is 15 seconds.
Max recalls	Defines the number of unsuccessful outbound calls which are allowed before the SVC is assumed to have failed. The default value is 30.

Call direction	Defines whether this SVC will accept incoming calls or make outgoing calls. **In** – Inbound calls only **Out** – Outbound calls only **Both –** Inbound or outbound calls.
Allow broadcast traffic	Define whether the network protocol may broadcast over this SVC when it is active. IP requires the ability to broadcast when running RIP or OSPF. Broadcasting over SVCs should be enabled on SVCs being used by IPX or DECnet Phase IV.
Require matching information rates	Controls whether this SVC will accept whatever information rates (CIR, Bc, Be) are proposed by a received call. If set to **Yes** then SVC calls will only be accepted if the information rates proposed are the same as the rates configured for this SVC. The default is **Yes**.
Committed Information Rate	Defines the committed information rate (CIR) that will be requested in an outbound call or that will be expected in an inbound call when running with *Require matching information rates* set to **Yes**. The range is 300 bps to 2048000 bps. The default is 64 Kbps.
Committed Burst Size (Bc)	Defines the maximum amount of committed data that the SVC can transmit. This value will be requested in an outbound call or will be expected in an inbound call when running with *Require matching information rates* set to **Yes**. The range is 300 bps to 2048000 bps. The default is 64 Kbps.
Excess Burst Size (Be)	Defines the maximum allowed amount of uncommitted data for the SVC. This value will be requested in an outbound call or will be expected in an inbound call when running with *Require matching information rates* set to **Yes**. The range is 0 bps to 2048000 bps. The default is 0 bps.
Assign Circuit Name	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 the Frame Relay destination name.

5.6 Frame Relay SVC Configuration Commands

Change C

Changes the configuration of a Frame Relay SVC previously added using the **add svc** command.

Syntax: add

svc

Example:

change svc

```
Frame Relay destination address?  router1
Idle timer? [60]:
Recall timer? [15]:
Maximum recalls? [30]:
Call direction (In/Out/Both)? [BOTH]
Allow broadcast traffic? [Yes]
Require matching information rates? [Yes]:
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc)in bits [64000]?
Excess Burst Size (Be) in bits [0]?
Assign circuit name []?
```

Delete C

Deletes the local address set using the **set local-address** command.

Syntax: delete

local-address

Example:

delete local-address baltimore

Disable C

Disable Frame Relay SVCs.

Syntax: disable

interface

svc . . .

interface

Disables Frame Relay SVCs on this interface. When disabled, all SVCs and PPP-FR Dial Circuits will not work. The default setting for this feature is disabled.

Example:

```
disable interface
```

svc *fr-destination-address*

Disables an individual Frame Relay SVC to a remote destination. No calls will be made or accepted by this SVC when it is disabled. The default setting for this feature is disabled.

Example:

```
disable svc
Frame Relay destination address []?
```

Enable C

Enable Frame Relay SVCs.

Syntax: enable
interface
svc . . .

interface

Enables Frame Relay SVCs on this interface. The default setting for this feature is disabled.

Example:

```
enable interface
```

svc *fr-destination-address*

Enables an individual Frame Relay SVC to a remote destination. Calls can be made or accepted by this SVC when it is enabled. The default setting for this feature is disabled.

Example:

```
enable svc
Frame Relay destination address []?
```

5.6 Frame Relay SVC Configuration Commands

List **C**

Display currently configured SVC information.

Syntax: list

all
local-address
maintenance-mode
state
svc
timers

all

Displays the current configuration of the Frame Relay SVC interface. The output display for this command is a combination of the **list local-address**, **list maintenance-mode**, **list timers**, **list state** and **list svc** commands.

Example:

```
list all
Local address                : baltimore
T303 (call setup timer)      : 4
T305 (disconnect timer)      : 30
T308 (release timer)         : 4
T310 (call proceed timer)    : 60
Maintenance mode             : disabled
SVC Interface status         : enabled
```

Local address	Displays the network address name of the local Frame Relay port.
T303 (call setup timer)	Indicates the number of seconds the router will wait for a call to be established before transmitting a new call set up request.
T305 (disconnect timer)	Indicates the number of seconds the router will wait for a response to a diconnect message. If it expires a release request is sent.
T308 (release timer)	Indicates the number of seconds allowed for a response to a release request. The first time it expires the release request is resent. If it expires again the circuit is cleared.

T310 (call proceed timer)	Indicates the number of seconds the router will wait for a call connect or disconnect message after receiving a call proceeding message during call setup. If it expires the call is disconnected
Maintenance mode	Indicates whether maintenance mode is enabled or not. Maintenance mode is for testing purposes only. It allows two routers to be connected back-to-back rather than over a Frame Relay network.
SVC Interface status	Indicates whether SVCs are enabled or disabled in this interface. The default is *disabled*.

local-address

Displays Frame Relay SVC local address configuration.

Example:

```
list local-address
Local address               : baltimore
```

maintenance-mode

Displays the status of Frame Relay SVC maintenance mode.

Example:

```
list maintenance-mode
Maintenance mode            : disabled
```

state

Displays the status of Frame Relay SVC activity. The status may *enabled* or *disabled*.

Example:

```
list interface
SVC Interface status            : enabled
```

5.6 Frame Relay SVC Configuration Commands

svc

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

Example:

```
list svc

    Maximum circuits allowable  =   64
    Total circuits configured   =    7

PPP-FR Switched Virtual Circuits
--------------------------------
          Circuit     Circuit    Circuit   CIR      Burst   Excess Mtchd
          Name        Number     Type     in bps    Size    Burst  Rates
  -----------------   -------    -------   ------   -----   -----  ----
  MPPP Pseudo Net 4      -       Switched  64000    64000   0        N
  PPP Pseudo Net 3       -       Switched  64000    64000   0        Y

Direct Switched Virtual Circuits
--------------------------------
SVC details for Frame Relay destination address: frremote
 Idle time:              0   Circuit name:           FrSVC-Out
 Recall timer:          15   Max. recalls:           30
 Committed info rate: 64000   Committed burst:        64000
    Excess burst:        0   Allow broadcast traffic: Yes
    SVC status:    Enabled   Call direction:          In
    Require matching information rates:               Yes
      Protocol: IP              Address:      16.23.104.25
      Protocol: DECnet          Address:      18.142
```

Maximum circuits allowable — Indicates the number of virtual circuits (PVCs or SVCs) that can exist for this interface.

Total circuits configured — Indicates the total number of currently configured virtual circuits (PVCs and SVCs) for this interface.

PPP/FR Switched Virtual Circuits

Circuit Name — Indicates the ASCII designation of the configured SVC.

The Circuit Name of SVCs in use by PPP-FR pseudo interfaces is set to *PPP Pseudo Net #*. Similarly, the Circuit Name of PVCs in use by MPPP-FR pseudo interfaces is set to *MPPP Pseudo Net* , where. # indicates the interface number of the pseudo interface

Circuit Number — Indicates the number of a currently configured SVC.

Circuit Type	Indicates the type of virtual circuit, *Permanent* or *Switched.* This command only lists Switched virtual circuits.
Committed Information Rate	Indicates the information rate guaranteed over the interface.
Committed Burst (Bc)	Indicates the maximum amount of committed data that the SVC can transmit, in the range of 300 bps to 2048000 bps.
Excess Burst (Be)	Indicates the maximum allowed amount of uncommitted data for the SVC in the range of 0 bps to 2048000 bps.
Mtchd Rates	Indicates whether this SVC accepts information rates proposed by the received call or not.

Direct Switched Virtual Circuits

SVC details for Frame Relay destination address	The network address name of the Frame Relay port at the remote router. This field uniquely identifies this SVC.
Idle time	Idle timer.
Circuit name	Name used to describe the circuit.
Recall timer	Indicates the wait time before a new call can be made if an outbound call is not accepted.
Max. recalls	Indicates the number of unsuccessful outbound calls which are allowed before the SVC is assumed to have Failed.
Committed info rate	Indicates the CIR that is assigned to this SVC.
Committed burst	Indicates the maximum amount of committed data that the SVC can transmit.
Excess burst	Indicates the maximum allowed amount of uncommitted data for the SVC.
Allow broadcast traffic	Indicates whether the network may broadcast over this SVC.
SVC status	Indicates whether the SVC is enabled or disabled.

5.6 Frame Relay SVC Configuration Commands

Call direction	Indicates whether this SVC accepts incoming calls or makes outgoing calls: **In** – Inbound calls only **Out –** Outbound calls only **Both –** Inbound or outbound calls
Require matching information rates	Indicates whether this SVC requires the information rates which match those configured for this SVC (**Yes**), or if it will accept information rates proposed by a received call (**No**).
Protocol	The network protocol used by this SVC, as configured by the **add protocol address** command.
Address	The node address for the Frame Relay port at the remote router, as configured by the **add protocol address** command. The format of this address depends on the protocol being used. It will be a 32-bit internet address (IP), a 48-bit MAC address (IPX or XNS) or an area and node number (DNA).

timers

Displays Frame Relay SVC timer configuration.

Example:

```
list timers
T303 (call setup timer)     : 4
T305 (disconnect timer)     : 30
T308 (release timer)        : 4
T310 (call proceed timer)   : 60
```

Remove C

Delete any SVC or protocol-address previously added using the **add** command.

Syntax: remove

svc . . .

protocol-address

svc *destination-name*

Deletes a configured SVC, identified by the assigned destination address.

Example:

```
remove svc baltimore
```

Note: You should not remove an SVC 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 ***protocol-name protocol-address***

Deletes any configured protocol addresses (static ARP entries). This parameter has different prompts for the protocol address depending on the type of protocol that you are removing. Possible prompts are listed in Table 5–8.

Example:

```
remove protocol-address
Protocol name or number [IP]?
IP Address [0.0.0.0]?
```

Table 5–8 Protocol Address Prompts for the Remove Command (SVC)

Protocol	Address Prompt
IP	`IP Address [0.0.0.0]?`
DN	`Node address [0.0]?`
IPX	`Host Number (in hex)[]?`
APL	`Node number (in decimal) []?`
AP2	`Network number (in decimal) []?` `Node number (in decimal) []?`

Protocol name or number Defines the name or number of the protocol that you are deleting. The supported protocol numbers and their names are:

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.

5.6 Frame Relay SVC Configuration Commands

Host Number	Defines the 48-bit MAC address of the IPX or XNS host.
Node number	Defines the node number, in the range 1–254 for AppleTalk Phase 1 networks, or 1–253 for AppleTalk Phase 2 networks.
Network number	Defines the AppleTalk Phase 2 network number, in the range 1–65279.

Set C

Configures the interface to run Frame Relay SVCs.

Syntax: set

local-address
maintenance-mode
timers

local-address *loc-address*

Sets 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 frame-relay address** command .

Example:

```
set local-address
Assign local address name []? toronto
```

maintenance-mode *state*

Configures Frame Relay SVC maintenance mode. Maintenance mode is only to be used for testing purposes. It allows two routers to use Frame Relay SVC protocol over a direct point-to-point connection with one of the routers configured as the DTE and the other as the DCE.

By default maintenance mode is disabled.

Example:

```
set maintenance-mode
DTE/DCE mode or NONE [DTE]?
```

5.6 Frame Relay SVC Configuration Commands

timers

Configures Frame Relay SVC timers.

Note: The default values for the timers are likely to be suitable for most Frame Relay networks. It is recommended that these should only be changed at the request of your Frame Relay network provider.

Example:

```
set timers
T303 (call setup) timer [4]?
T305 (disconnect) timer [30]?
T308 (release) timer [4]?
T310 (call proceed) timer [60]?
```

T303 (call setup) timer	Configures the interval, in seconds, to wait for a response to a call setup request before resend the request. The default is 4 seconds.
T305 (disconnect) timer	Configures the interval, in seconds, to wait for a response to a disconnect request. If this timer expires a release is sent. The default is 30 seconds.
T308 (release) timer	Configures the interval, in seconds, to wait for a response to a release request. The first time it expires the release is resent. If it expires again the circuit is cleared. The default is 4 seconds.
T310 (call proceed) timer	Configures the interval, in seconds, to wait for a call to be connected or disconnected after a call proceeding message. If this timer expires the call is disconnected. The default is 60 seconds.

Exit C

Return to the previous prompt level.

Syntax: exit

5.7 Frame Relay LAPF Configuration Commands

The Frame Relay LAPF configuration commands allow you to modify the lower layer protocol for a Frame Relay SVC. The full LAPF sequenced datalink is only used to transmit call control information into he Frame Relay network. Data is transmitted using only the core aspects of LAPF. This section summarizes and then explains the Frame Relay LAPF configuration commands. Defaults for any command and its parameters are enclosed in brackets immediately following the prompt.

In most circumstances the default parameters for LAPF are likely to be correct. It is recommended that these parameters are only changed at the request of your Frame Relay network provider.

Table 5–9 summarizes the Frame Relay LAPF configuration commands.

Table 5–9 Frame Relay LAPF Configuration Command Summary

Command	Task	Function
? (Help)	Configure	Lists configuration commands and parameters.
List	Configure	Displays the current LAPF configuration.
Set	Configure	Configures the properties associated with Frame Relay LAPF parameters (frame size, retransmission count, timers and window size).
Exit	Configure	Exits the Frame Relay LAPF configuration process and returns to the previous prompt level.

? (Help) C

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
```

5.7 Frame Relay LAPF Configuration Commands

List C

Display currently configured LAPF information.

Syntax: list

all
frame-size
retransmission-count
timers
window-size

all

Displays the current configuration of the LAPF protocol. The output display for this command is a combination of the **list frame-size**, **list retransmission-count**, **list timers**, and **list window-size** commands.

Example:

```
list all
Retransmission count        : 10
Maximum frame size          : 0
T200 (retransmission timer) : 15
T203 (idle timer)           : 30
LAPF window size            : 127
```

Retransmission count	Indicates the number of times a frame will be retransmitted before the link is considered to be down.
Maximum frame size	Indicates the maximum frame size that can be sent on the LAPF link. A value of 0 indicates that the maximum frame size will be based on the MTU setting for this interface, as shown by the **list hdlc** command at the `FR Config>` prompt.
T200 (retransmission timer)	Indicates the interval, in seconds, to wait for an acknowledgement of a frame. If this timer expires the frame is resent.
T203 (idle timer)	Indicates the maximum interval, in seconds, with no activity. If this timer expires a poll message is sent to verify that the link is still operational.
LAPF window size	Indicates the maximum number of packets that can be outstanding before an acknowledgement is sent.

5.7 Frame Relay LAPF Configuration Commands

frame-size

Displays maximum LAPF frame size.

Example:

```
list frame-size
Maximum frame size          : 0
```

retransmission-count

Displays the number of times a frame will be retransmitted before the link is considered to be down..

Example:

```
list retransmission-count
Retransmission count        : 10
```

timers

Displays Frame Relay LAPF timer configuration.

Example:

```
list timers
T200 (retransmission timer) : 15
T203 (idle timer)           : 30
```

window-size

Displays maximum LAPF window size.

Example:

```
list window-size
LAPF window size            : 127
```

Set C

Configures the LAPF protocol parameters for use by Frame Relay SVCs.

Syntax: set

frame-size
retransmission-count
timers
window-size

5.7 Frame Relay LAPF Configuration Commands

frame-size *value*

Assigns the maximum frame size that can be sent on the LAPF link. A value of 0 indicates that the maximum frame size will be based on the MTU setting for this interface (see the **list hdlc** command at the `FR Config>` prompt). The default value is 0.

Example:

```
set frame-size
N201 (LAPF frame size) [0]?
```

retransmission-count *value*

Defines the number of times a frame will be retransmitted with no acknowledgement before the link is considered down. The default value is 10.

Example:

```
set retransmission-count
N200 (retransmission count) [10]?
```

timers *value*

Configures LAPF timers.

Example:

```
set timers
T200 (retransmission timer) [15]?
T203 (idle timer) [30]?
```

T200 (retransmission timer)	Defines the maximum interval, in seconds, to wait for an acknowledgement before retransmitting a frame. The default is 15 seconds.
T203 (idle timer)	Defines the number of seconds that a LAPF link can be idle before a poll message is sent to confirm that the link is operational. The default is 30 seconds.

window-size

Configures maximum LAPF window size.

Example:

```
set window-size
LAPF window size [7]? 127
```

5.7 Frame Relay LAPF Configuration Commands

Exit C

Return to the previous prompt level.

Syntax: exit

Example:

```
exit
```

6

Configuring and Monitoring ISDN Network Interfaces

This chapter describes how to configure and monitor an ISDN interface on the router.

6.1 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 certain switches. Contact your service provider to determine if SPID is requried.

Note: The **AW900EI** supports only one switch type and frame size for all twelve ISDN ports. The **AW900EP** supports only one switch type for both Primary Rate ISDN ports.

6.2 Basic Rate and Primary Rate ISDN

ISDN supports the use of multiple Bearer (B) channels for data transfer and a Data (D) channel which is used to set up calls. The bandwidth is shared between the channels by using time division multiplexing over a single line.

- A **Basic Rate ISDN** (BRI) interface supports two 64 Kbps B-channels and one 16 Kbps D-channel.

- A **Primary Rate ISDN** (PRI) interface runs over an E1 line (PRI-E1) or a T1 line (PRI-T1). Each channel (B and D) operates at 64 Kbps.
  - **PRI-T1** supports 23 B-channels and one D-channel.
  - **PRI-E1** supports up to 30 B-channels and one D-channel.

There is a different model of router for each of these ISDN types.

6.3 Configuration Procedures

This section describes how to configure your ISDN interface. The tasks you need to perform are as follows:

1. Add ISDN addresses.
2. Add Dial Circuits.
3. Configure Dial Circuit parameters.
4. Configure ISDN parameters.

You must restart the router for configuration changes to take effect.

Refer to Chapter 2 for details about configuring Dial Circuits on an ISDN interface.

6.4 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 20 numbers as well as 11 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.

6.4 Adding ISDN Addresses

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 [1-20 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.

6.4.1 Configuring ISDN Parameters

This section describes how to configure the basic ISDN parameters for BRI or PRI interfaces.

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 []? baltimore
   ```

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. Set the directory number (DN) of the local port if it is required. Refer to Section 6.4.3 for more information about the use of directory numbers.

   Use the **set dn0** (directory number 0) command. The PTT should supply you with the correct setting. It will usually be the same as your phone number, but not always.

   ```
   ISDN Config>set dn0
   Enter DN0 (Directory-Number-0); 'C' to clear [ ]?1-555-0983
   ```

6.4 Adding ISDN Addresses

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 datalink 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
   ```

6.4.2 Configuring Primary Rate ISDN Interfaces

In addition to the procedure described in Section 6.4.1, you must complete the following steps to configure the line parameters for a PRI interface:

1. Access the PRI line configuration process, using the **line** command:

   ```
   ISDN Config>line
   PRI Line user configuration
   PRI Line Config>
   ```

2. Specify the framing format to be used, if different to the default. The default framing for a T1 line is **EXTENDED-SUPER-FRAME**, and for an E1 line is **CRC-MULTI-FRAME**

   Use the **set framing** command. Enter one of the valid frame formats for your line type.

   ```
   PRI Line Config>set framing crc-double-frame
   PRI Line Config>
   ```

3. Specify the encoding format to be used, if different to the default. The default encoding for a T1 line is **B8ZS**, and for an E1 line is **HDB3**.

Use the **set encoding** command. Enter one of the valid frame formats for your line type.

```
PRI Line Config>set encoding ami
PRI Line Config>
```

6.4.3 Incoming Call Handling

The DN0 setting can be used to improve the processing of incoming calls. If this parameter is not set, any incoming call on the interface will be accepted. Only if it is set to some value will incoming calls be “screened” by matching the Called Party Address to the setting of DN0 or DN1. If you wish to share the S-Bus between multiple ISDN devices, you will need to set this value appropriately.

The following steps should be followed when configuring DN0:

- If you only have a single device on the S-Bus, do not set DN0 or DN1 to any value. If they are already set, you can clear them using the **clear isdn** command; you will then need to reconfigure any ISDN parameters you may have set, such as local address, SPIDs, and so on.
- If you wish to share the S-bus, and your network provides a **Called Address** for incoming calls, DN0 must be set to match the number presented in the incoming call. If you are unsure of what number will be presented as the Called Address, follow these console steps:
  1. Clear or leave DN0 un-set.
  2. Enable all ISDN events.
  3. Generate an incoming call to the ISDN interface.
  4. Record the value presented in event message ISDN.41.
  5. Set DN0 to match the recorded value.
  6. Restart.
- If the ISDN network is not supplying a Called Address on incoming calls, the value of DN0 has no effect. All calls will be accepted.
- DN0 *must* be entered as a string of digits, and *not* the name of an ISDN address entry (as is used for Local Address).

6.4.4 Optional ISDN Parameters

This section describes optional ISDN parameters. For a complete description of these commands, see Section 6.6.

- If you are not using an INS64 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 limit 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 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.

6.5 Displaying the ISDN Console Prompt

To display the ISDN console 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>
```

ISDN console commands allow you to view the accounting entries, calls, circuits, parameters, and statistics of the ISDN interfaces.

There is no console prompt for Dial Circuits, but you can monitor the Dial Circuits that are mapped to the ISDN interface.

6.6 ISDN Configuration and Console Commands

Table 6–1 summarizes and the following sections explain the ISDN configuration and console commands.

Enter configuration commands at the `ISDN Config>` prompt.

6.6 ISDN Configuration and Console Commands

Enter console (monitoring) commands at the `ISDN>` prompt.

Table 6–1 ISDN Configuration and Console Commands Summary

Command	Task	Function
? (Help)	Configure/Monitor	Displays all the ISDN commands or lists subcommand options for specific commands.
Accounting	Monitor	Displays accrued telephone charges for Dial Circuits on the current interface.
All-accounting	Monitor	Displays accrued telephone charges for Dial Circuits on all interfaces.
Calls	Monitor	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.
Circuits	Monitor	Shows the status of all data circuits configured on the ISDN interface.
Line	Configure/Monitor	Access the Primary Rate ISDN Line configuration or console process
List	Configure	Displays the ISDN configuration.
Parameters	Monitor	Displays the current parameters for the ISDN interface.
Set	Configure	Sets the frame size, local address, no answer timeouts, number of retries after no answer, type of ISDN switch, directory numbers, TEI, and SPID.
Statistics	Monitor	Displays the current statistics for the ISDN interface.
Timers	Monitor	Displays the current Idle Timer and Initial Minimum Timer values.
Exit	Configure/Monitor	Returns to the previous prompt level.

? (Help) C M

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.
```

6.6 ISDN Configuration and Console Commands

Accounting M

Displays accrued telephone charges for each Dial Circuit on the current interface.

Syntax: accounting

Example:

```
accounting
Net Interface  Charge units[Current Call][Total   ]  State    Reason
  3    PPP/0               0            0          Down
  4    PPP/1               0            0          Disabled
```

All-accounting M

Displays accrued telephone charges for all Dial Circuits on all ISDN interfaces.

Syntax: all-accounting

Example:

```
all-accounting
Net Interface  Charge units[Current Call][Total   ]  State    Reason
  3    PPP/0               0            0          Down
  4    PPP/1               0            0          Disabled
  5    PPP/2               0            0          Disabled
  6    PPP/3               0            0          Disabled
```

Calls M

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
3     SL/0     v403                 2      0      0      0
4     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.

Blckd 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.

Unmapped connection indications: Connection attempts the router refused because there were no enabled Dial Circuits configured to accept the incoming calls.

Circuits M

Shows the status of all Dial Circuits configured on the ISDN interface.

Syntax: circuits

Example:

```
circuit
Net Interface  MAC/Data-Link    State     Reason      Duration
3     PPP/0    Point to Point    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 datalink protocol configured for this Dial Circuit.

State Current state of the Dial Circuit:

- **Up B*n*** – Currently connected using the B-channel that is indicated by the value of *n*. The maximum value for *n* is:

  2 on a BRI line

  23 on a PRI T1 line

  30 on a PRI E1 line
- **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.
- **CB Rsp –** an incoming call was cleared because call-back was enabled (accepter).
- **Bad ID** – Local ID protocol exchange failed – the caller’s local address did not match an inbound destination at the remote end.
- **Encp Fld –** PPP self test failed
- **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.

6.6 ISDN Configuration and Console Commands

Line C M

Accesses the Primary Rate ISDN line configuration process or console process. Refer to Section 6.7 for information about the PRI Line configuration and console commands.

Syntax: line

Example:

```
ISDN Config> line
PRI Line user configuration
PRI Line Config>
```

Example:

```
ISDN> line
PRI Line console
PRI Line>
```

List C

Displays the current ISDN configuration.

Syntax: list

Example:

```
list
                                   ISDN Configuration

Local Network Address Name    = line-1-local
Local Network Address         = 1-555-898-1234
Local Network Subaddress      = 21

Maximum frame size in bytes   = 1024
Outbound call address Timeout =    180  Retries =  2
Switch Variant                = ETSI NET3
DN0 (Directory Number 0)      = 1-555-898-1234
DN1 (Directory Number 1)      = 1-555-898-3456
TEI                           = Automatic
```

6.6 ISDN Configuration and Console Commands

Parameters M

Displays the current ISDN configuration.

Syntax: parameters

Example:

```
parameters
 ISDN Port parameters:

 Local Address Name:        vl233
 Local Network Address:     20
 Local Network Subaddress:
 Frame Size:         2048
 Switch Variant:     France Telecom VNx
 PS1 detect:         Disabled
 TEI:                32
 Directory Number 0: 20
 Directory Number 1: 21
 Outbound call address Timeout:     0        Retries:      0

 Accounting Name           Network Address   Network Subaddress
 ---------------           ---------------   ------------------
 vl215                     22
 vl218                     22
 vl231                     21
 vl233                     20
```

Set C

Configures frame size, addresses, and timeouts, and specifies the switch-variant and TEI number.

Syntax: set

dn0 (directory number 0) . . .
dn1 (directory number 1) . . .
framesize . . .
local-address-name . . .
multipoint-selection . . .
retries-call-address . . .
service-profile-id . . .
switch-variant . . .
tei (terminal endpoint identifier) . . .
timeout-call-address . . .

dn0 ***network dial address***

If you require directory numbers, set the directory number of the local port. **Dn0** must match the value supplied by the PTT. Any non-dialable characters that you type are stripped from the number before dialing. If there are no dialable characters, the setting is cleared.

Refer to your ISDN service provider to determine whether directory numbers are supported or required and see Section 6.4.3 for more information about the use of directory numbers.

Example:

```
set dn0
Enter DN0 (Directory-Number-0); ’C’ to clear [ ]? 1-555-898-1234
```

dn1 ***network dial address***

Directory number 1 (dn1) is a second directory number supported by some switch variants. Any non-dialable characters that you type are stripped from the number before dialing. If there are no dialable characters, the setting is cleared.

Example:

```
set dn1
Enter DN1 (Directory-Number-1); ’C’ to clear [ ]? 1-555-898-1235
```

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 datalink and MAC layer headers. Set the frame size so that it is greater than or equal to the frame size of the datalink 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
```

6.6 ISDN Configuration and Console Commands

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
```

multipoint-selection ***off*** or ***on***

Applies only to switch variant 5ESS. Default is *off* (point-to-point operation). Specifying *on* selects multipoint operation.

Example:

```
set multipoint-selection on
```

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 retries the router is allowed to make to establish a call to a non-responding address during the timeout period. For example, when **retries-call-address** is set to 2, a total of three attempts are permitted within the timeout period specified.

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
```

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, NI1, or 5ESS multipoint. 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
```

switch-variant

Specifies the model of the switch to which this ISDN interface is connected.

Example:

```
set switch-variant
Switch-Variant-Model []? net3
```

Switch-Variant Model	Specify the switch variant that the ISDN interface is connected to. • Basic rate ISDN supports: **NET3** (*default*), **INS64**, **5ESS**, **DMS100**, **VN3**, **NI1** or **AUSTEL**. • Primary Rate ISDN supports: **NET5** (*default*), **INS1500**, **4ESS**, **5ESS**, **DMS100**, **NI2** or **AUSTEL**.

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
```

6.6 ISDN Configuration and Console Commands

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
```

Statistics M

Displays the current statistics for this ISDN interface.

Syntax: statistics

The format of the listing for a **BRI** interface is:

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
```

The format of the listing for a **PRI** interface is different. (Note that the output for B-channels B8 onwards have been suppressed in this example.)

Example:

```
statistics
 Link:   Active    ISDN Firmware:   0.0    Handler State: Running

 Channel Total     Total    Transmit  Receive  Invalid
         Transmits Receives    Bytes    Bytes  Interrupts

 D           32788    32789   196767   196785            0
 B1         230217   164342 22797579  6572411            0
 B2         164336   208255  6572177  9517221            0
 B3              0        0        0        0            0
 B4              0        0        0        0            0
 B5              0        0        0        0            0
 B6              0        0        0        0            0
 B7              0        0        0        0            0

          and so on

Channel  Tx Error Rx Error Overflow Underrun       Abort CRC Error

 D               0        0        0        0            0         0
 B1              0        5        0        0            5         0
 B2              0        0        0        0            0         0
 B3              0        0        0        0            0         0
 B4              0        0        0        0            0         0
 B5              0        0        0        0            0         0
 B6              0        0        0        0            0         0
 B7              0        0        0        0            0         0

          and so on
```

These displays show the current state of the link, the firmware revision, and the state of the Dial Circuits. They also show statistics on what was transmitted and received on the interface and error counters.

6.6 ISSDN Configuration and Console Commands

Timers **M**

Displays the current idle timer and Initial Minimum Timer statistics for each B-channel on this ISDN interface.

Syntax: timers

Example:

```
timers
Net Interface Idle:Config:now IMCT:Profile-name:Config:Now State Reason
  3    PPP/0       10     0     DEFAULT          30    0   Up B1 IP Data
  4    PPP/1        0     0     DEFAULT          30    0   Avail Rmt Disc
  5    PPP/2        0     0     DEFAULT          30    0   Avail Rmt Disc
  6    PPP/3        0     0     DEFAULT          30    0   Avail Rmt Disc

          and so on
```

Exit **C M**

Returns to the previous prompt level.

Syntax: exit

Example:

```
example
```

6.7 PRI Line Configuration and Console Commands

Table 6–2 summarizes and the following sections explain the PRI Line configuration and console commands.

Enter configuration commands at the `PRI Line Config>` prompt.

Enter console (monitoring) commands at the `PRI Line>` prompt.

Table 6–2 PRI Line Configuration and Console Commands Summary

Command	Task	Function
? (Help)	Configure/Monitor	Displays all the PRI Line commands or lists subcommand options for specific commands.
List	Configure	Displays the PRI Line configuration.
Parameters	Monitor	Displays the current parameters for thePRI line.
Set	Configure	Sets the frame format, line encoding format an clocking source.
Statistics	Monitor	Displays the current statistics for the PRI Line.
Exit	Configure/Monitor	Returns to the previous prompt level.

? (Help) C M

Lists available commands or lists the command's options.

Syntax: ?

Example:

```
set ?
CLOCKING
ENCODING
FRAMING
```

6.7 PRI Line Configuration and Console Commands

List C

Displays the current PRI Line speed (E1 or T1) and configuration.

Syntax: list

Example:

```
list
            Primary Rate ISDN (E1) Line Configuration

Framing:   Multi-Frame with CRC          Encoding: HDB3
Clocking:              External
Slot Speed:          64 Kbits/s
```

Parameters M

Displays the current PRI Line speed, configured parameters and channel type at each slot. The framing and encoding codes are described under the **set** command.

Syntax: parameters

Example:

```
parameters
                Primary Rate ISDN (E1) Line Parameters

    Framing:                    E1-MF-CRC              Encoding: HDB3
    Clock Source:               External
    Default Slot Speed:         64 Kbit/s
                             1                   2                   3
    Slot:  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
    Type:                              D

     Key: D = ISDN D-channel X = Reserved
```

Set C

Configures framing format, line encoding format and clocking source.

Syntax: set
clocking . . .
encoding . . .
framing . . .

6.7 PRI Line Configuration and Console Commands

clocking ***internal*** or ***external***

Specifies the source of the transmit clock. The default is **External**, indicating that the clock source is taken from the line. **Internal** is only used for maintenance and testing.

Example:

```
set clocking external
```

encoding

Specifies the line encoding format to be used.

Example:

```
set encoding jbzs
```

Encoding Specify the **Zero Code Suppression** format. Valid formats on an E1 line are:

AMI

JBZS

HDB3 (*default*)

Valid formats on a T1 line are:

AMI

JBZS

B8ZS3 (*default*)

Note: An encoding of **JBZS** reduces the slot bandwidth to 56 Kbps.

framing

Specifies the framing format to be used.

Example:

```
set framing crc-double-frame
```

Encoding Specify the **Zero Code Suppression** format. Valid formats on an E1 line are:

DOUBLE-FRAME displayed as E1-DF

CRC-DOUBLE-FRAME displayed as E1-DF-CRC

MULTI-FRAME displayed as E1-MF

CRC-MULTI-FRAME (*default*) displayed as E1-MF-CRC

Valid formats on a T1 line are:

SUPER-FRAME displayed as T1-SF

EXTENDED-SUPER-FRAME (*default*) displayed as T1-ESF

Statistics M

Displays the current statistics for this ISDN interface.

Syntax: statistics

alarms

all

errors

alarms

Displays the status of all the alarm indicators.

Example:

statistics alarms

```
               Primary Rate ISDN (E1) Line Alarm Counters

Signal Loss               0  Alarm Indication          0
Frame Alignment           0  Remote Alarm              0
No Multiframe             0  Multiframe Loss           0
```

all

Displays the status of all the error counters and alarms.

Example:

statistics all

```
               Primary Rate ISDN (E1) Line Alarm Counters

Signal Loss               0  Alarm Indication          0
Frame Alignment           0  Remote Alarm              0
No Multiframe             0  Multiframe Loss           0

               Primary Rate ISDN (E1) Line Error Counters

Framing Errors            0  Code Violations           0
CRC Errors                0  E-bit Errors              0
```

errors

Displays the status of all the error counters.

Example:

```
statistics errors
                Primary Rate ISDN (E1) Line Error Counters

  Framing Errors             0  Code Violations           0
  CRC Errors                 0  E-bit Errors              0
```

Exit C M

Returns to the previous prompt level.

Syntax: exit

Example:

```
example
```

6.8 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 an ISDN interface, enter **interface** followed by the interface number of the ISDN interface.

6.8 ISDN and the GWCON Commands

A **BRI** interface has 2 B-channels and the output from the interface command looks like this:

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
```

A **PRI T1** interface has 23 B-channels and **PRI E1** interface has 30 B-channels and the output from the interface command looks like this:

Example:

```
interface 2
                                Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec     Passed     Failed       Failed
2  2   ISDN/1    80002000   4C         10          9            0

  ISDN Base Net MAC/data-link on Primary Rate ISDN interface
 Link: Inactive    ISDN Firmware:   1.0    Handler State: Installed

 Channel Total     Total    Transmit  Receive  Invalid
         Transmits Receives    Bytes    Bytes  Interrupts

 D             673      675     4088     4134           0
 B1          55900    47559 24659589  8549622           0
 B2          21689    17063  7389026  5643732           0
 B3              0        0        0        0           0
 B4              0        0        0        0           0
 B5              0        0        0        0           0
 B6              0        0        0        0           0
 B7              0        0        0        0           0
 B8              0        0        0        0           0
```

```
B9              0        0        0        0           0
B10             0        0        0        0           0
B11             0        0        0        0           0
B12             0        0        0        0           0
B13             0        0        0        0           0
B14             0        0        0        0           0
B15             0        0        0        0           0
B16             0        0        0        0           0
B17             0        0        0        0           0
B18             0        0        0        0           0
B19             0        0        0        0           0
B20             0        0        0        0           0
B21             0        0        0        0           0
B22             0        0        0        0           0
B23             0        0        0        0           0

Channel  Tx Error Rx Error Overflow Underrun       Abort CRC Error

D               0        0        0        0           0         0
B1              0        0        0        0           0         0
B2              1        0        0        0           1         0
B3              0        0        0        0           0         0
B4              0        0        0        0           0         0
B5              0        0        0        0           0         0
B6              0        0        0        0           0         0
B7              0        0        0        0           0         0
B8              0        0        0        0           0         0
B9              0        0        0        0           0         0
B10             0        0        0        0           0         0
B11             0        0        0        0           0         0
B12             0        0        0        0           0         0
B13             0        0        0        0           0         0
B14             0        0        0        0           0         0
B15             0        0        0        0           0         0
B16             0        0        0        0           0         0
B17             0        0        0        0           0         0
B18             0        0        0        0           0         0
B19             0        0        0        0           0         0
B20             0        0        0        0           0         0
B21             0        0        0        0           0         0
B22             0        0        0        0           0         0
B23             0        0        0        0           0         0
```

6.8 ISDN and the GWCON Commands

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 Primary Rate ISDN 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, then *Nt*' 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.

Vec Interrupt vector address.

Self-Test Passed Number of successful self-tests.

Self-Test Failed Number of unsuccessful self-tests.

Maintenance Failed Number of maintenance failures.

Line speed Transmit clock speed (approximate).

Last port reset Length of time since the port was reset.

Input frame errors:

- *Error* Errors other than one of the following error types.
- *Overflow* Packets that are larger than the defined frame size.
- *Overrun* Packets received before previously received packets were processed.
- *Abort* Packets aborted by the sender or a line error.

CRC error Packets received with checksum errors and as a result were discarded.

Output frame counters:

Error Errors other than one of the following error types.

Overflow Packets that are too large for the device buffer.

Underrun Data was not available when it was needed for the next octet transmission.

Abort 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
2   MCF   MAC Filtering
4   X25S  X25 Switching
5   RMON  Remote Monitoring
6   TEL   Telesaving

8 Networks:
Net Interface  MAC/Data-Link        Hardware                     State
```

6.8 ISDN and the GWCON Commands

```
0   Eth/0      Ethernet/IEEE 802.3  SCC Ethernet               Up
1   FR/0       Frame Relay          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
```

7

Configuring and Monitoring Logical Link Control

This chapter describes how to configure and monitor logical link control (LLC) for LAN interfaces (Token Ring and Ethernet) in the router.

7.1 Accessing the LLC Configuration or Console Process

Access the LLC configuration process by issuing the LLC command from the LAN interface configuration process. Access the LLC console process by issuing the LLC command from the LAN interface console process. Refer to Chapter 3 for more details about Ethernet interfaces or Chapter 10 for more details about Token Ring interfaces.

Example:

```
ETH Config>LLC
LLC user configuration
LLC Config>
```

Example:

```
ETH>LLC
LLC user monitoring
LLC>
```

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.

Enter configuration commands at the `LLC Config>` prompt.

Enter console (monitoring) commands at the `LLC>` prompt.

7.2 LLC Configuration and Console Commands

This section explains all of the LLC configuration and console commands. These commands let you configure the LLC when you need to pass packets over a local area network such as Token Ring or Ethernet. Table 7–1 lists LLC configuration and console commands.

Table 7–1 LLC Configuration and Console Command Summary

Command	Task	Function
? (Help)	Configure/ Monitor	Displays all the LLC commands or lists subcommand options for specific commands.
Clear-counters	Monitor	Clears all statistical counters.
List	Configure/ Monitor	Displays interface, SAP, and session information.
Set	Configure/ Monitor	Allows the user to configure SAP timers and thresholds.
Exit	Configure/ Monitor	Exits the config and monitor processes and returns to the previous prompt level.

? (Help) C M

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:

```
LLC Config>?
LIST
SET
EXIT
```

Example:

```
LLC>?
CLEAR-COUNTERS
LIST
SET
EXIT
```

7.2 LLC Configuration and Console Commands

Clear-Counters M

Clear all the LLC statistical counters.

Syntax: clear-counters

Example:

```
clear-counters
```

List C

Display Service Access Point (SAP) information.

Syntax: list

Example:

```
list
Reply Timer(T1):                 1 seconds
Receive ACK Timer(T2):           1 100miliseconds
Inactivity Timer(Ti):            30 seconds
Max Retry value(N2):             8
Rcvd I-frames before Ack(N3):    1
Transmit Window(Tw):             2
Receive Window(Rw):              2
Acks needed to increment Ww(Nw): 1
```

List M

Display interface, Service Access Point (SAP), and session information.

Syntax: list
all
interface
sap . . .
session

all

Displays all LLC open SAPs, grouped by interface, and their corresponding number of sessions. All LLC-enabled interfaces are scanned, so interfaces other than the one specified with the preceding **network** command are listed.

Alternate interfaces listed include the virtual bridge network interface.

7.2 LLC Configuration and Console Commands

Note: Virtual interfaces are numbered higher than the physical interfaces. For example, on a RouteAbout Access TW (with physical interfaces zero through two), the bridge network number is four (4).

To list the SAP or Session detail of SAPs shown on an interface other than the current interface, it is necessary to return to the console process and re-enter the **network** command specifying the network interface number displayed in the **list all** output.

Example:

```
list all
========== Interface: 0, Eth/0 ==========
SAP    Number of Sessions
7E     1
========== Interface: 1, Eth/1 ==========
SAP    Number of Sessions
F4     1
```

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. Use the **list interface** command to see the SAPs opened on this interface.

Example:

```
list sap 7e
Interface:                      00,Eth/0
Reply Timer(T1):                1 sec
Receive ACK Timer(T2):          1 100millisec
Inactivity Timer(Ti):           30 sec
MAX Retry Value(N2):            8
MAX I-Field Size(N1):           1500
Rcvd I-frames before Ack(N3):   7
Transmit Window Size(Tw):       127
Acks Needed to Inc Ww(Nw):      1

Frame Type          Xmt      Rcvd
UI-frames:            0         0
TEST-frames:          0         0
XID-frames:           2         2
I-frames:             3         3
RR-frames:         6372      6371
RNR-frames:           0         0
```

```
REJ-frames:          0         0
SABME-frames:        2         0
UA-frames:           0         2
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:  2
Number of active sessions:      2
Session ID                                                 Remote
(int-sap-id)  Local MAC          Remote MAC          SAP     State
00-7E-0000    08-00-2B-B6-D8-E4  AA-00-04-00-6B-A5  7E      LINK_OPENED
00-7E-0001    08-00-2B-B6-D8-E4  AA-00-04-00-F6-F5  7E      LINK_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).

7.2 LLC Configuration and Console Commands

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-frames refused by LLC user	Counter that displays the number of I-frames discarded by the software above the LLC, for example, LNM (LAN Network Manager).
Cumulative number of sessions	The total number of sessions opened over this SAP.
Number of active sessions	The total number of currently active sessions that are running over the interface.
Session ID (int-sap-id)	The session ID for the console interface.
Local MAC	The router's LLC MAC address. **Note:** Ethernet and Token Ring MAC addresses are displayed differently. For example, 08-00-2B-B6-D8-E4 is an Ethernet MAC address and 10:00:D4:6D:1B:27 is a Token Ring MAC Address.
Remote MAC	The remote system's LLC MAC address.
Remote SAP	The Service Access Point address of the remote LLC station.
Remote State	The finite state(s) that results from interaction between the LLC peers. There are 21 states that are described below.
Link_Closed	The remote LLC peer is not known to the local LLC peer and is considered as not existing.
Disconnected	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.
Link_Opening	The state of the local LLC peer after sending a SABME or UA in response to a received SABME.
Disconnecting	The state of the local LLC after sending a DISC command to the remote LLC peer.
FRMR_Sent	The local LLC peer entered the frame reject exception state and sent a FRMR response across the link.

Link_Opened	The local LLC peer is in the data transfer phase.
Local_Busy	The local LLC peer is unable to receive additional I-frames.
Rejection	An local LLC peer that received one or more out-of-sequence I-frames.
Checkpointing	The local LLC peer sent a poll to the remote LLC peer and is waiting for an appropriate response.
KPT_LB	A combination of checkpointing and local busy states.
CKPT_REJ	A combination of the checkpointing and rejection states.
Resetting	The local LLC peer received a SABME and is reestablishing the link.
Remote_Busy	The state that occurs when an RNR is received from the remote LLC peer.
LB_RB	A combination of local_busy and remote_busy states.
REJ_LB	A combination of rejection and local_busy states.
REJ_RB	A combination of rejection and remote_busy states.
CKPT_-REJ_LB	A combination of checkpointing, rejection, and local_busy states.
CKPT_CLR	A combination state resulting from the termination of a local_busy condition while the LLC peer is CKPT_LB.
CKPT_-REJ_CLR	A combination state resulting from the transfer of an unconfirmed local busy clear while the link station is in the CKPT_REJ_LB state.
REJ_LB_RB	A combination of the rejection, local_busy, and remote_busy states.
FRMR_-Received	The local LLC peer has received an FRMR response from the remote LLC peer.

7.2 LLC Configuration and Console Commands

Session

Displays information on the specified LLC session that is open on the interface. Use the **list SAP** command to find the Session Id for an open SAP.

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
Reply Timer:                  1 sec
Receive ACK Timer(T2):        1 100milisec (note: not used when N3=1)
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.
Remote SAP	The remote side SAP of the LLC connection.
Local SAP	The local side SAP of the LLC connection.
RIF	The actual RIF of the frame on a Token Ring interface. This field is not used on an Ethernet interface and is set to 0.
Access Priority	Priority of the packet. 0-7 for upper layer control.
State	The finite state(s) that results from interaction between the LLC peers. Refer to the **list sap** command previously described in this chapter for more information.
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 I-field size (N1)	Maximum size of the data field (in bytes) of a frame. Default is the size of the interface.
MAX Retry Value (N2)	The maximum number of times the LLC transmits an RR without receiving an acknowledgment
Rcvd I-frames 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 of I-frames that can be sent before receiving an RR.
Working transmit size (Ww)	The maximum number of I-frames that are sent before receiving an RR. This can be less than Tw during the dynamic window algorithm.
Acks Needed to Inc Ww (Nw)	Indicates the number of I-frames that the LLC must receive before incrementing Ww by 1.
Current send seq (Vs)	Send state variable (Ns value for the next I-frame to be transferred).
Current Rcv seq (Vr)	Receive state variable (next in-sequence Ns to be accepted).

Last ACK'd sent frame (Va)	Acknowledged state variable (last valid Nr received).
No. of frames in ACK pend q	Number of transmitted I-frames waiting for acknowledgment.
No. of frames in transmit pend q	Number of frames waiting to be transmitted.
Local Busy	The local side of the LLC connection is sending RNRs.
Remote Busy	The remote side of the LLC is receiving RNRs.
Poll Retry count	Indicates the current value of the retry of the counter (counts down) in the LLC protocol.
Appl output flow stopped	The LLC told the application to stop sending outgoing data frames.
Send process running	Runs concurrently with all other frame actions and takes I-frames in the transmit queue and sends them.
Frames - Xmt and Rcvd	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-frames refused by LLC user	Counter that displays the number of I-frames discarded by the software above the LLC, for example, LNM (LAN Network Manager).

7.2 LLC Configuration and Console Commands

Set **C M**

Configure the LLC timer and threshold parameters.

Changing LLC parameters from the default can affect how the LLC protocol works.

From the `LLC config>` prompt, the set command sets the parameters for the interface being configured. In the monitoring process (at the `LLC>` prompt) the set command affects the parameters for a specified session. The LLC2 session must be running before you can modify any of the timer or threshold values.

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 *count*

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:

```
LLC config>set n2-max_retry count
```

Example:

```
LLC>set n2-max_retry session-ID  count
```

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:

```
LLC config>set n3-frames-rcvd-before-ack  count
```

Example:

```
LLC>set n3-frames-rcvd-before-ack  session-ID  count
```

7.2 LLC Configuration and Console Commands

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:

```
LLC config>set nw-acks-to-inc-ww  count
```

Example:

```
LLC>set nw-acks-to-inc-ww  session-ID  count
```

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:

```
LLC config>set t1-reply-timer  count
```

Example:

```
LLC>set t1-reply-timer  session-ID  count
```

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 milliseconds). Minimum is 1. Maximum is 2560.

Example:

```
LLC config>set t2-receive-ack-timer  seconds
```

Example:

```
LLC>set t2-receive-ack-timer  session-ID seconds
```

Note: You must set a meaningful value for this timer. If it is set to 1 (the default), it does not run (for example, `n3-frames-rcvd-before-ack=15`).

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:

```
LLC config>set ti-inactivity-timer  seconds
```

Example:

```
LLC>set ti-inactivity-timer  sessions-ID  seconds
```

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:

```
LLC config>set tw-transmit-window  count
```

Example:

```
LLC>set tw-transmit-window  session-ID  count
```

Exit C M

Return to the previous prompt level.

Syntax: exit

Example:

```
exit
```

8

Configuring and Monitoring Point-to-Point Protocol Network Interfaces

This chapter describes how to configure and monitor Point-to-Point Protocol (PPP) devices, PPP over Frame Relay PVCs (PPP-FR pseudo devices) and PPP over Frame Relay SVCs (PPP-FR Dial Circuits). Features and commands specific to one or other type of interface are indicated.

This chapter also describes how to configure PPP Multilink bundles (MP bundle pseudo devices) containing fixed PPP network interfaces and MP Dial Circuits (also referred to as Link Circuits). See Section 8.4 for details of configuring MP bundles.

For more information about PPP refer to the *Routing Protocols Reference Guide*. For more information about PPP-FR and Frame Relay interfaces and configurations, refer to Chapter 5, and to the *Routing Protocols Reference Guide*.

For more information about configuring PPP-FR Dial pseudo devices, refer to Chapter 2, and to the *Routing Protocols Reference Guide*.

8.1 Accessing the Interface Configuration and Console Processes

Follow the procedures described in Chapter 1 to access the interface configuration and console processes for PPP network interfaces.

To use PPP over a Frame Relay SVC you add a pseudo Dial Circuit (PPP-FR Dial) which is mapped to a Frame Relay network interface. To configure the PPP aspects of a PPP-FR Dial Circuit use the **encapsulate** command from the `Circuit config>` prompt to access the `PPP-FR config>` prompt.

To configure an MP Link circuit in an MP bundle, use the **link** command from the `MPB Config>` prompt to access the `Link Config>` prompt.

Enter configuration commands at the configuration prompt.

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.

Enter console (monitoring) commands at the console prompt.

Table 8–1 summarizes the variety of device types which are based on the Point-to-Point protocol, with the configuration and console prompts for each type of PPP interface.

Table 8–1 Point-to-Point Configuration and Console Prompts

Device Type	Configuration Prompt	Console Prompt
PPP serial line or PPP Dial Circuit	`PPP Config>`	`PPP>`
PPP-FR pseudo device or PPP-FR Dial Circuit	`PPP-FR Config>`	`PPP-FR>`
Multilink PPP Bundle	`MPB Config>`	`MPB>`
Multilink PPP fixed link	`MP Config>`	`MP>`
Multilink PPP-FR fixed link	`MPPP-FR Config>`	`MPPP-FR>`
Multilink PPP Link Circuit	`Link Config>`	`MP Link>`

The commands which are available at each of these command prompts are applicable for the specific device type being accessed. Invalid commands are suppressed. For example, the **set frame-relay** command is available only when configuring PPP over Frame Relay since it is not relevant to PPP serial line interfaces.

Note: When you access a PPP Dial Circuit or a PPP-FR Dial pseudo device you get the `Circuit Config>` or `Circuit>` prompt. You must use the **encapsulate** command to get to the PPP or PPP-FR configuration or monitoring prompt shown above.

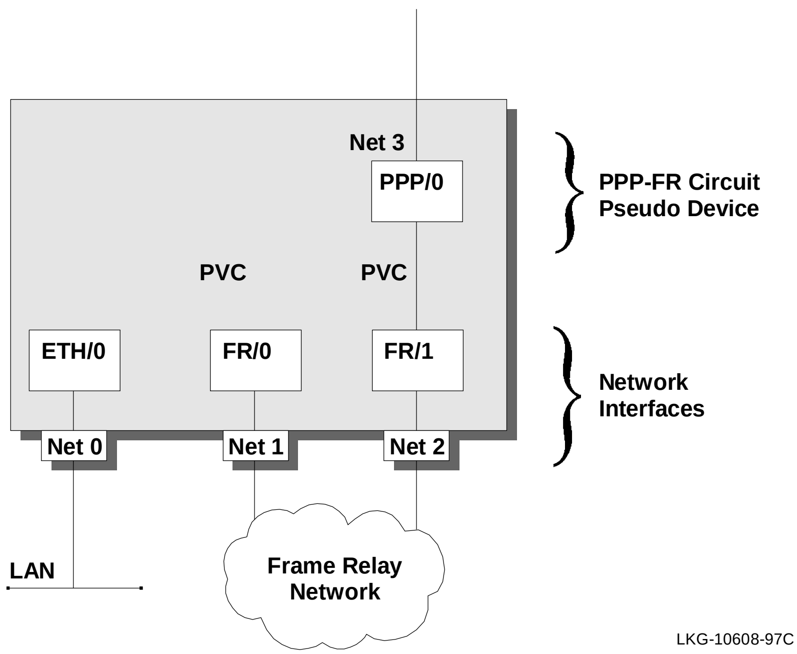
8.2 PPP-FR PVC Configuration Procedure

This section describes how to configure your router to use Point-to-Point Protocol over a Frame Relay PVC. Briefly, you must add a PPP-FR pseudo interface and associate it with a PVC on the Frame Relay interface.

8.2 PPP-FR PVC Configuration Procedure

Figure 8–1 illustrates an imaginary router with one Ethernet port (Net 0) and two serial ports (Net 1 and Net 2). The serial ports have been configured with Frame Relay (FR) as the datalink protocol, so the interface names are FR/0 and FR/1. A PPP-FR Circuit device has been added as Net 3 and its interface name is PPP/0. This device has been mapped to use a PVC on FR/1 at Net 2.

Figure 8–1 Configuring a PPP-FR Circuit Pseudo Device



Note: The interface numbers used in this procedure are for illustration purposes only. The actual interface numbers you use will depend on the physical arrangement of ports on the router you are configuring.

The procedure which follows demonstrates how to set up this configuration:

1. **Configure a Frame Relay Interface**. If the Frame Relay interface has not already been configured, follow the procedure described in Chapter 5 to configure a Frame Relay interface.
2. **Add PPP-FR Pseudo Devices**. PPP-FR pseudo devices are mapped to permanent virtual circuits over a Frame Relay interface. You can map multiple PPP-FR Circuit pseudo devices to one Frame Relay interface, but each has its

own PVC. The DIGITAL RouteAbout Access 90 supports a maximum of 8 PPP-FR pseudo interfaces, and the DIGITAL RouteAbout Central 900 can support up to 32.

To add a PPP-FR pseudo device, use the **add device ppp-fr-circuit** command from the `Config>` process. The software assigns a network interface number to each PPP-FR pseudo device. In this example it adds Net 3. It also assigns the interface name PPP/*n*, where *n* is the next available PPP interface. In this example it is PPP/0. You will use the network interface number to configure the PPP-FR pseudo device.

Example:

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

3. **Configure PPP-FR Pseudo Device**. Configure PPP-FR pseudo devices using the `PPP-FR Config>` process. To get the PPP-FR `Config>` prompt, use the `Config>` **network** command followed by the network interface number of the PPP-FR pseudo device.

Example:

```
Config>network 3
PPP-FR configuration
PPP-FR Config>
```

4. **Create an associated Frame Relay PVC.** Use the **set frame-relay** command to associate the PPP-FR pseudo device with a Frame Relay network interface. A PVC will be created automatically on the Frame Relay device for use by this PPP-FR pseudo device. You must specify the DLCI number for the PVC.

Example:

```
PPP-FR config>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]?
```

You can configure the PPP attributes of the PPP-FR pseudo interface using the commands described in Section 8.6 in this chapter. The commands which relate to HDLC do not apply to PPP-FR pseudo interfaces since all data transfer is performed by the Frame Relay protocol. These commands are not available from the PPP-FR config process.

Note: You must restart the router for these changes to the system configuration to take effect.

8.3 PPP-FR Dial Circuit Configuration Procedure

To encapsulate Point-to-Point Protocol over a Frame Relay SVC you must enable SVCs on the Frame Relay network interface, add a PPP-FR Dial device and map it to the Frame Relay network interface. The PPP-FR dial device is a pseudo Dial Circuit. You use the `Circuit Config>`**set network** command to map the PPP-FR Dial device to the Frame Relay network interface and the **encapsulator** command to access the `PPP-FR Config>` prompt.

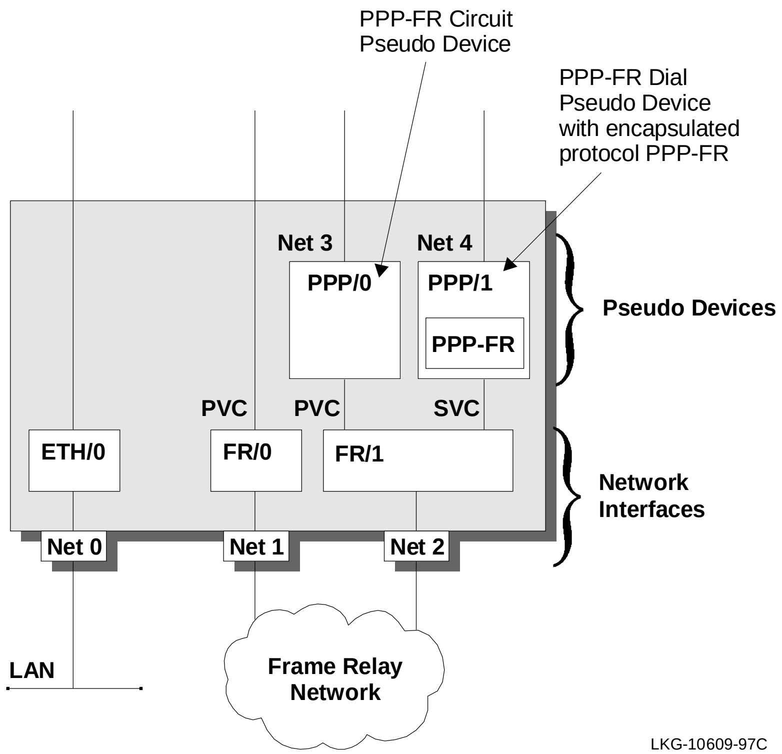
Figure 8–2 shows the same router configuration illustrated in Figure 8–1, with the addition of a PPP-FR Dial pseudo device, which uses a Frame Relay SVC on Net 2.

The PPP-FR Dial pseudo device has been added as Net 4, using the command **add device ppp-fr-dial**. It has been given interface name PPP/1.

When you use the `Config>`**net 4** command you get the `Circuit Config>` prompt because this is a Dial Circuit device. Use the command **set net 2** to associate the PPP-FR Dial pseudo device with the Frame Relay interface. This command will automatically create an SVC on the Frame Relay interface for use by the PPP-FR Dial pseudo device.

To configure PPP on the PPP-FR pseudo device use the **encapsulate** command to get to the `PPP-FR Config>` prompt.

Figure 8–2 Configuring a PPP-FR Dial Pseudo Device



Refer to Chapter 5, Configuring and Monitoring Frame Relay Network Interfaces, for the procedure and commands to configure Frame Relay SVCs. Refer to Chapter 2, Configuring and Monitoring Dial Circuits, for the procedure and commands to configure a PPP-FR Dial device.

8.4 PPP Multilink Bundle Configuration Procedures

This section describes how to configure your router to treat a group (or bundle) of PPP circuits as a multilink PPP device. These groups are known as PPP Multilink bundles (MP bundles). The circuits in the MP bundle may be fixed PPP network interfaces, PPP Dial Circuits over V.25 *bis* or ISDN network interfaces, PPP-FR PVC pseudo devices or PPP-FR SVC Dial Circuits. The PPP-FR devices in the MP bundle could even be mapped to a Frame Relay Dial Circuit over an ISDN network interface.

8.4 PPP Multilink Bundle Configuration Procedures

The procedures in the next sections describe how to configure Multilink PPP bundles using Multilink PPP leased lines, Multilink PPP Dial Circuits over V.25 *bis* or ISDN, Multilink PPP-FR pseudo devices (MPPP-FR pseudo devices) and Multilink PPP-FR Dial Circuits (MPPP-FR Dial pseudo devices).

8.4.1 Upgrading Multilink PPP from DRS Version 2 to Version 3

The configuration structures for PPP Multilink bundles has changed since version 2 of the Distributed Routing Software. In particular:

- MP Dial Circuit devices are no longer required or supported. They are replaced by PPP MP Bundle pseudo devices.
- All Multilink bundles must have an associated MP Bundle pseudo device. Fixed links (leased lines or PVCs) are included in multilink bundles by associating them with the MP Bundle pseudo device.

When the router is rebooted after the upgrade from Version 2 to Version 3 any existing MP Dial Circuit devices will be disabled. You must convert these devices to PPP MP Bundle pseudo devices by using the **change device ppp-mp-bundle *net#*** command at the `Config>` prompt, where ***net#*** is the network interface number of the Multilink Bundle device:

Example:

```
change device ppp-mp-bundle
Interface number [0]?4
```

When the router is rebooted again, the new PPP MP Bundle pseudo device will use the Multilink configuration which was set up for the MP Dial Circuit.

All network interface ports which have been configured for Multilink PPP under Version 2 will be disabled by default because they are not yet associated with a PPP MP Bundle device. To correct this:

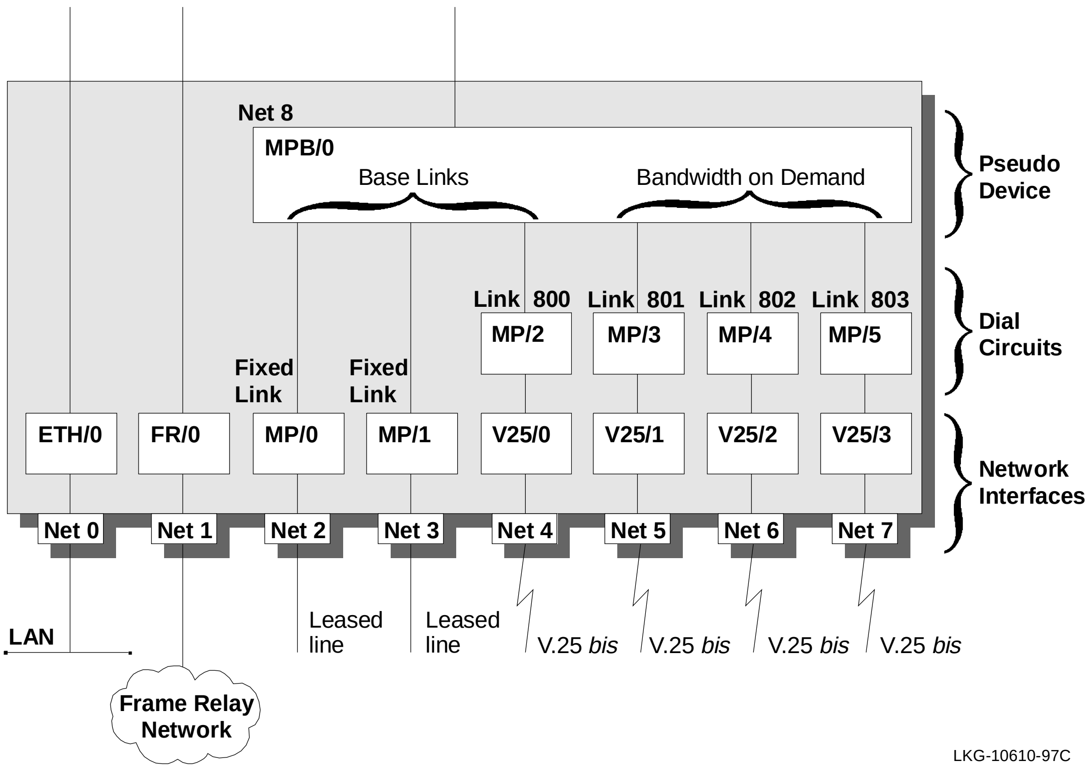
1. Ensure that there is a suitable PPP-MP-Bundle device (either create one using the `Config>` **add device ppp-mp-bundle** command, or upgrade a Version 2 MP Dial Circuit using the **change device ppp-mp-bundle *net#*** command).
2. Associate the physical port with the PPP MP Bundle pseudo device using the `MP Config>` **command set fixed add *net#***, where ***net#*** is the network interface number of the leased line.

The following sections illustrate the new structure of PPP Multilink bundles and describe in detail how to configure them.

8.4.2 Configuring an MP Bundle Using V.25 *bis* Dial Circuits

Figure 8–3 illustrates an imaginary router with one Ethernet port (Net 0) and seven serial ports (Net 1 through Net 7). Net 1 has been configured with Frame Relay (FR) as the datalink protocol, so its interface name is FR/0. Net 0 and Net 1 are not used in the Multilink Bundle.

Figure 8–3 Configuring an MP Bundle Using V.25 *bis*



The serial ports Net 2 through Net 7 have been combined using the Multilink Bundle device MPB/0 at Net 8.

8.4 PPP Multilink Bundle Configuration Procedures

Net 2 and Net 3 have been configured as Multilink PPP datalinks (MP/0 and MP/1) and are connected to leased lines, so they are **fixed links**. Net 4 through Net 7 are each connected to V.25 *bis* modems so they are dial devices and can be used for **dynamic links**.

The Multilink Bundle device MPB/0 has a total of 6 Multilink PPP devices, MP/0 through MP/5 of which two are fixed links. The remaining four links are dynamic **link circuits**. The link circuits are created automatically as Link 800, 801, 802 and 803 when the MPB/0 device is configured. Initially the link circuits are not associated with any network interface. Each one has to be manually configured to use its corresponding V.25 *bis* network interface.

The three **base links** in the bundle consist of the two fixed links and one of the link circuits. The other three link circuits provide **Bandwidth on Demand**.

To configure the Multilink PPP bundle illustrated in Figure 8–3 perform the following steps:

1. **Configure the network interfaces for the fixed links.** At the `Config>` prompt, set the datalink protocol to **multilink-ppp** for each leased line network interface which will be included in the MP bundle as a fixed link (Net 2 and Net 3 in this example).

Example:

```
Config>set data-link multilink-ppp 2
Config>set data-link multilink-ppp 3
```

Note: The interface names will become MP/0 and MP/1. The configuration process prompt for fixed multilink PPP interfaces is `MP Config>.` This process only lets you **set** or **list** the HDLC and LCP parameters. These commands are described in Section 8.6. All other PPP options are set per MP Bundle when configuring the MP Bundle device.

2. **Configure the network interfaces for the Dial Circuits.** In this example Net 4, Net 5 Net 6 and Net 7 must be be set up as V.25 *bis* network interfaces, but you can use ISDN or Frame Relay SVCs. Refer to Chapter 6 for details about configuring ISDN network interfaces, and Chapter 11 for details about configuring V.25 *bis* network interfaces.

Example:

```
Config>set data-link v25bis 7
```

Note: You do not need to add the Dial Circuit devices, since they will be created automatically for you when you configure the Multilink Bundle device.

8.4 PPP Multilink Bundle Configuration Procedures

3. **Add local and remote dial addresses.** In this example we must add V.25 *bis* network addresses. Add ISDN addresses if using ISDN interfaces. Enter a network address name and a network dial address name for each network interface and for each destination port. The *network dial address* is the number of the local or destination port. The *network address name* can be anything, such as a description of the port.

Example:

```
Config>add v25-bis-address locaddrname locdialaddr
Config>add v25-bis-address remaddrname remdialaddr
Config>
```

4. **Add the MP Bundle device MPB/0.** Use the **add device** command to add the PPP multilink bundle device.

Example:

```
Config>add device ppp-mp-bundle
```

5. **Configure the MP Bundle device.** At the `Config>` prompt use the **net** command to access the configuration prompt for the MP bundle device. Configuring PPP options on the Bundle device sets those options for all links within the bundle. For example, set PAP or CHAP authorization passwords per bundle.

Example:

```
Config>net 8
PPP Multilink Protocol Bundle configuration
MPB Config>
```

Note: The commands available from this configuration process are the same as for a standard PPP interface, with the addition of the **set/list fixed** commands, the **set/list mp** commands and the **link** command.

6. **Add the leased line network interfaces to the PPP multilink bundle.** Use the **set fixed add** command to add each multilink PPP network interface or PPP-FR pseudo device to the bundle. Fixed links can be used only as Base links for the bundle since they cannot be connected dynamically.

Example:

```
MPB Config>set fixed add 2
MPB Config>set fixed add 3
```

7. **Define the number of links in the bundle.** Use the **set mp** command to define the MP Bundle options. The base links will be opened when the MP Bundle device is started. In this example, the number of circuits defined by *Base links* (3) is greater than the number of fixed links we have configured (2), so a dynamic link will be used to complete the base.

   The difference between the value of *Max links* (6) and the number of fixed links (2) we have configured determines the total number of dynamic MP links (Dial Circuits) in the bundle (6 - 2 = 4). These four dynamic **link circuits** are created automatically when the router is restarted.

   The **set mp** command also prompts for bandwidth on demand (BoD) parameters, and the destination name which will be assigned by default to each link circuit in the bundle.

Example:

```
MPB Config>set mp
Base Links  [1]? 3
Max Links  [3]? 6
Base idle timer  [60]?
BoD threshold:  [70]?
BoD sample time  [30]?
BoD base link line speed  [64000]?
BoD add link persistence  [5]?
BoD delete link persistence  [10]?
Assign default destination address name []?vremote
MPB Config>
```

8. **Restart the router.** You must restart the router for the Dial Circuits to be created and available.

9. **Identify the Dial Circuits in the bundle.** Use the `MPB>` or `MPB Config>` **link** command to display the link numbers of the dynamic link circuits. The first digit of a dynamic link number identifies the interface number of the MP bundle device, and the remaining digits identify each circuit. For example Link 801 is Dial Circuit 01 within the MP bundle at Net 8.

Example:

```
MPB Config>link
Link      Base  Datalink/Hardware       Dest Out Dest In
--------------------------------------------------------
800       0                             vremote
801       0                             vremote
802       0                             vremote
803       0                             vremote
MPB Config>
```

10. **Map each Dial Circuit in the bundle to a base network interface.** Use the **link** command to access the `Link Config>` prompt for each Dial Circuit in turn. (`Link Config>` is equivalent to the `Circuit Config>` process for Dial Circuits). Use the **set net** command to map each Dial Circuit to its base network interface (ISDN or V.25 *bis*).

Example:

```
MPB Config>link 800
Link configuration
Link Config>set net 4
```

11. **Verify the link connections**.Use the **link** command again to display the link numbers of the dynamic link circuits. This time you should see the base networks that you have assigned to each link circuit:

Example:

```
MPB Config>link
Link      Base  Datalink/Hardware       Dest Out Dest In
--------------------------------------------------------
800       4     WAN V.25bis             vremote
801       5     WAN V.25bis             vremote
802       6     WAN V.25bis             vremote
803       7     WAN V.25bis             vremote
MPB Config>
```

12. **Configure each Dial Circuit in the bundle**. Use the `Link Config>` **set** command to configure the call direction and inbound destination for each Dial Circuit in turn. You can override the default destination address on individual links if you wish. All the options are described in Section 8.7.

Example:

```
Link Config>set calls both
Link Config>set any_inbound
Link Config>set destination vremote2
```

Note: The Link Config process cannot set the idle timer for an individual link circuit, and it has no encapsulate command. The PPP protocol and base idle timer are controlled from the MP bundle device (MPB/0).

8.4.3 Configuring an MP Bundle Using ISDN Dial Circuits

The procedure for configuring Multilink PPP over ISDN Dial Circuits is almost identical to that described above.

8.4 PPP Multilink Bundle Configuration Procedures

Figure 8–4 illustrates an imaginary router with one Ethernet interface (Net 0) and two serial ports (Net 1 and Net 2) which are connected to an ISDN network.

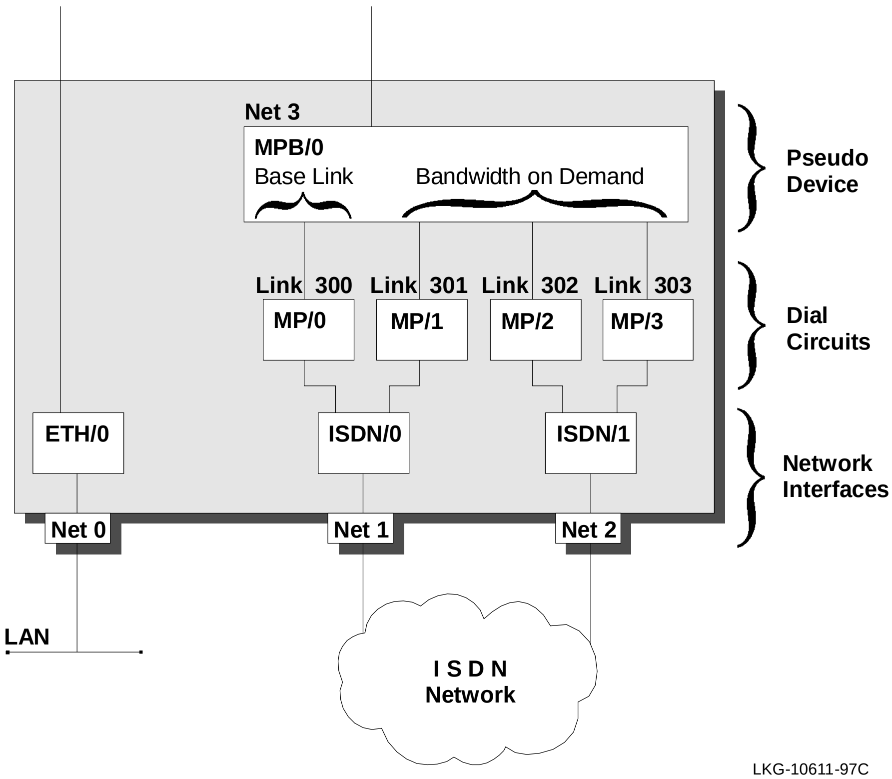
Each ISDN interface can carry two Dial Circuits. The Multilink PPP Bundle device MPB/0 has been added as Net 3 with a maximum of four links. Leased lines could have been used as fixed links in the bundle but this example has no fixed links. As a result four dynamic link circuits have been created (Link 300, 301, 302 and 303). Link 300 and 301 have been manually configured to use ISDN/0 on Net 1. Link 302 and 303 have been configured to use ISDN/1.

Link circuit 301 (MP/0) is treated as the Base link, and the others are used for Bandwidth on Demand.

The local and remote dial addresses have been defined using the **add isdn-address** command.

8.4 PPP Multilink Bundle Configuration Procedures

Figure 8–4 Configuring an MP Bundle Using ISDN



Note: The example Multilink PPP Bundle illustrated in Figure 8–5 is called a **demand** bundle because the base link is a Dial Circuit, so connections are made only on demand. If the base idle timer is set to 0, then none of the Dial Circuits would ever time out.

8.4.4 Configuring PPP-FR links in a MP Bundle

The procedure for configuring PPP-FR pseudo devices in a PPP Multilink bundle is also similar to that described in Section 8.4.2.

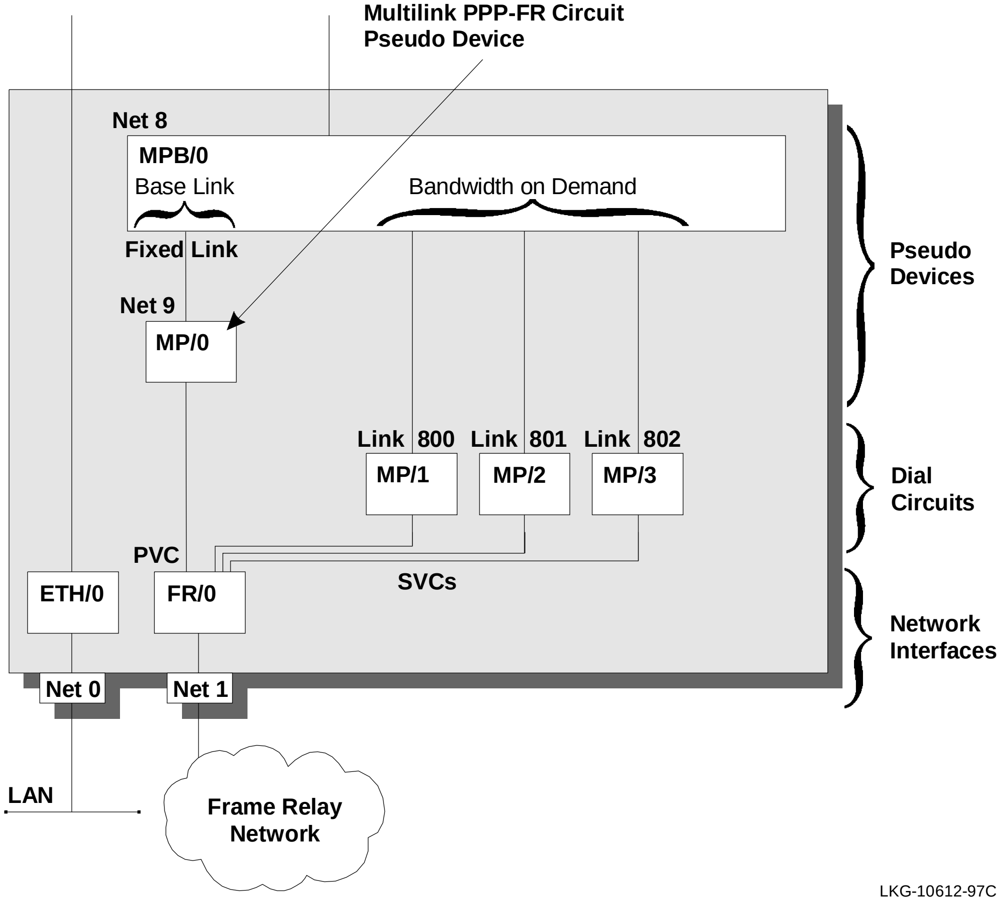
Figure 8–5 illustrates an imaginary router with one Ethernet interface (Net 0) and shows one serial port (Net 1) which is connected to a Frame Relay network. FR/0 on Net 1 has been configured for PVCs and SVCS. Other physical ports are not shown on the diagram.

8.4 PPP Multilink Bundle Configuration Procedures

A Multilink Bundle device was added as Net 8, and a Multilink PPP-FR Circuit pseudo device was created as Net 9 and has been configured to use a Frame Relay PVC on FR/0. Net 9 has then been added to MPB/0 as a fixed link.

The bundle has just one fixed link as a base circuit, and a further three dynamic links for Bandwidth on Demand. When each of the link circuits is configured to use Net 1, the system detects that this is a Frame Relay interface and sets up PPP-FR dial connections over Frame Relay SVCs.

Figure 8–5 Configuring an MP Bundle Using PPP-FR



8.4 PPP Multilink Bundle Configuration Procedures

To configure PPP-FR pseudo devices in a PPP Multilink bundle do the following:

- **Create Multilink PPP-FR Circuit pseudo devices**. To use a Multilink PPP-FR Circuit pseudo device as a *fixed* link, create a PPP-FR Circuit pseudo device using the **add ppp-fr-circuit** command at the `Config>` prompt, and use the **set data-link multilink-ppp** command to enable it to be included in a PPP multilink bundle. The configuration prompt for these interfaces is `MPPP-FR Config>`. This process lets you **set** or **list** the Frame Relay interface and the LCP options only. Use the set frame command to associate the MPP-FR device with a Frame Relay PVC. For example, to configure MP/0 on Net 9 as shown in Figure 8–5 use the following commands:

Example:

```
Config>add ppp-fr-circuit
Use "net 9" command to configure parameters
Config>set data-link multilink-ppp 9
Config>net 9
PPP Multilink Protocol user configuration
MPPP-FR Config>set frame 1
Frame Relay PVC DLCI number?  [0]? 123
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc) in bits [64000]?
Excess Burst Size (Be) in bits [0]?
MPPP-FR Config>
```

- **Configure the MP bundle device**. The procedure is the same as described previously. Add the fixed links, specifying the Multilink PPP-FR Circuit pseudo device number, using the `MPB Config>`**set fixed add** command. Configure the circuits in the bundle using the **set mp** command and map the Dial Circuits to the Frame Relay network interface number using the `Link Config>` **set net** command.

Note: The **set net** command prompts for Frame Relay parameters if the network interface is a Frame Relay interface. The link circuits then function as PPP-FR Dial Circuits using SVCs on the Frame Relay interface.

Example:

```
MPB Config>set fixed add 9
MPB Config>set mp
Base Links  [1]?1
Max Links  [2]?4
Base idle timer  [65535]?
BoD threshold:  [70]?
BoD sample time  [30]?
BoD base link line speed  [64000]?
```

```
BoD add link persistence  [5]?
BoD delete link persistence  [10]?
Assign default destination address name []?fremote
MPB Config>link 800
Link Config>set net 1
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc) in bits [64000]?
Excess Burst Size (Be) in bits [0]?
Link Config>
```

8.5 Using PPP-FR Dial Circuits over ISDN

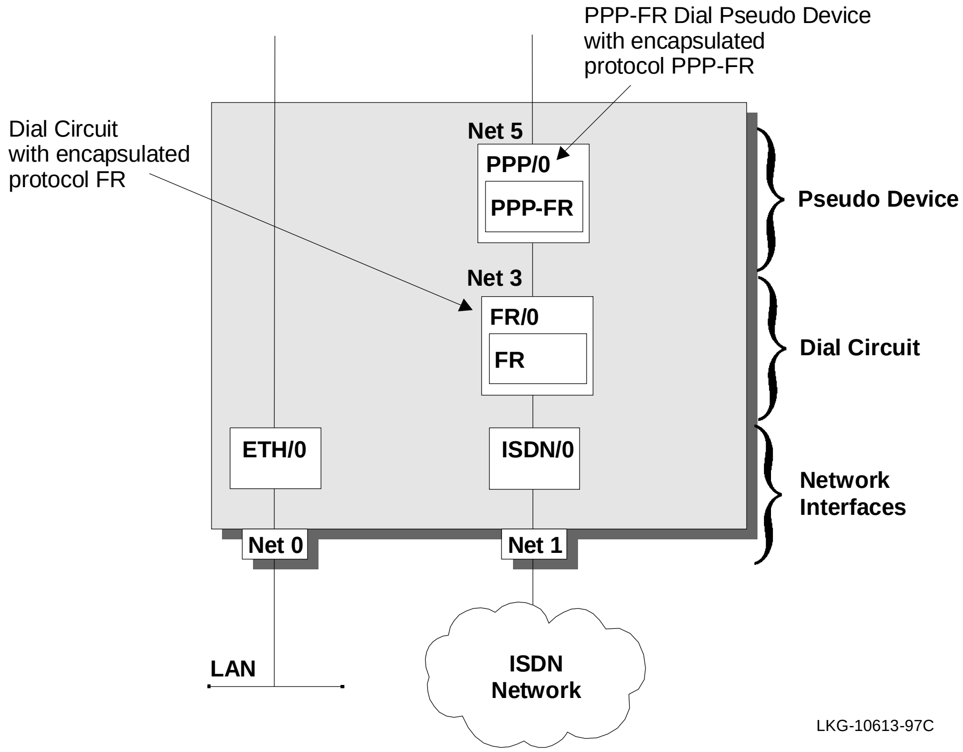
When you configure PPP-FR pseudo devices or PPP-FR Dial Circuits the Frame Relay interface is usually a Serial port connected to the Frame Relay network. However, you may also use a Frame Relay Dial Circuit over an ISDN network interface as the base network for a PPP-FR pseudo device.

For example, Figure 8–6 illustrates an imaginary router with one Ethernet interface (Net 0) and shows one serial port (Net 1) which is connected to an ISDN network. (That is, ISDN is being used to connect to the Frame Relay network service).

Some devices are not shown, but a Dial Circuit has been added as Net 3 and configured with datalink FR (Frame Relay). You can use the `Circuit Config>` **encapsulate** command to access the `FR Config>` prompt, and the `Circuit Config>` **set net** command to associate this Dial Circuit with ISDN/0 on Net 1.

A PPP-FR Dial pseudo device has been added as Net 5. By using Net 3 (FR/0) as the base network for the PPP-FR Dial device this circuit is routed over the ISDN interface.

Figure 8–6 Configuring PPP-FR Dial over ISDN



Refer to Chapter 2, Configuring and Monitoring Dial Circuits, for the procedure and commands to configure Frame Relay Dial Circuits over ISDN.

8.6 Point-to-Point Configuration and Console Commands

Table 8–2 summarizes the PPP and PPP-FR configuration and console commands. All commands apply to both types of interface unless otherwise indicated. The sections that follow explain these commands.

Table 8–2 Point-to-Point Configuration and Console Command Summary

Command	Task	Function
? (Help)	Configure/ Monitor	Displays all the Point-to-Point commands or lists the options for specific commands.
Clear	Monitor	Clears all statistics from PPP interfaces.

8.6 Point-to-Point Configuration and Console Commands

Table 8–2 Point-to-Point Configuration and Console Command Summary

Delete	Configure	Deletes local and remote identifiers and passwords.
Link	Configure/ Monitor	Access the `Link Config>` or `MP Link>` prompt for PPP multilink Dial Circuits.
List	Configure/ Monitor	Lists all information related to the point-to-point interface protocols, parameters, options, and statistics.
Profile-list	Configure	Lists Call Blocking, Initial Minimum Call Timer or Call Back telesaving profiles.
Set	Configure	Sets HDLC parameters, LCP options and parameters, IPCP options, BNCP options, PAP parameters, PAP IDs/passwords, CHAP parameters, CHAP IDs/passwords, NCP and CCP parameters, MP Bundle parameters and telesaving profiles.
Exit	Configure/ Monitor	Exits the PPP configuration process and returns to the previous prompt level.

Help (?) C M

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
LINK
DELETE
PROFILE_LIST
EXIT
```

Note: There are several variations of the PPP Configuration and Monitoring process (PPP serial interface, PPP-FR pseudo interface, Multilink PPP Bundle device and so on). Each one offers a subset of the commands described in this chapter. The **Help** command displays only the commands which are available to the process you are using.

8.6 Point-to-Point Configuration and Console Commands

Example:

PPP Serial Line Interface:

```
PPP config>list ?
ALL
HDLC
LCP
IPCP
BNCP
CCP
PROFILES
PARAMETERS
AUTHENTICATION
```

Example:

PPP Multilink Bundle Pseudo Device:

```
MPB config>list ?
ALL
FIXED
LCP
IPCP
BNCP
CCP
MP
PROFILES
PARAMETERS
AUTHENTICATION
```

Example:

PPP-FR-Circuit Pseudo Device:

```
PPP-FR config>list ?
ALL
LCP
IPCP
BNCP
CCP
PROFILES
PARAMETERS
AUTHENTICATION
FRAME-RELAY
```

8.6 Point-to-Point Configuration and Console Commands

Clear **M**

Clear all statistics from point-to-point interfaces.

Syntax: clear

Example:

```
clear
```

Delete **C**

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

Syntax: delete

chap
pap

chap

Deletes remote CHAP identifiers and passwords (if they exist).

Example:

```
delete chap
 Delete Remote ID/Password 789/012? [Yes]:
```

pap

Deletes local PAP identifiers and passwords.

Example:

```
delete pap
```

Link **C**

Display a summary listing of the dynamic circuits in the PPP multilink (MP) bundle, or enter the configuration process for the specified dynamic circuit. Use this command without a qualifier to provide a summary listing of the dynamic links in the MP bundle, or with a qualifier to access the configuration prompt for a specific dynamic circuit.

The circuit number consists of the interface number of the MP bundle and the circuit within the bundle. For example, if the MP Bundle is configured on interface 5, the first two Dial Circuits in the bundle would be 500 and 501.

8.6 Point-to-Point Configuration and Console Commands

Refer to Section 8.7 for details of the Link configuration and console commands.

Syntax: link *circuit#*

This example accesses the Link Config process for Dial Circuit 501:

Example:

```
MPB Config>link 501
Link configuration
Link Config>
```

The next example lists the available Dial Circuits in the MP bundle on network interface 5. 500 is a Frame Relay SVC. 501and 502 are V.25 *bis* circuits. Dial Circuit 503 has not yet been configured, so its *Base* field is 0 and *Dest Out* field is set to *frremote* by default

Example:

```
MPB Config>link
Link   Base   Datalink/Hardware                 Dest Out Dest In
-----------------------------------------------------------------
500    1      WAN Frame Relay                   frremote frlocal
501    2      WAN V.25bis                       vremote  vlocal
502    3      WAN V.25bis                       vremote  vlocal
503    0                                        frremote
```

In the next example the listing shows that there are two configured ISDN Dial Circuits in the MP bundle on interface 18.

Example:

```
MPB Config>link
Link   Base Net  Datalink/Hardware                 Dest Out Dest In
--------------------------------------------------------------------
1800   6         ISDN                                       ANY
1801   6         ISDN                                       ANY
```

Link	Identifies the link. This number identifies the network number of the MP Bundle device, and the dynamic circuit instance within the bundle. For example, link 501 is a V.25 *bis* Dial Circuit in the MP Bundle at interface 5.
Base	Indicates the number of the base network interface for the Dial Circuit. The value is 0 if the link circuit has not been configured.
Datalink/Hardware	Identifies the datalink protocol of the base network interface. This field is blank if the circuit has not been configured.
Dest Out	Identifies the network dial address of the remote station for outgoing calls on the circuit. By default it takes the value of the *Default destination address name* for the MP Bundle defined using the **set mp** command.
Dest In	Identifies the local network dial address .

Link M

Display a summary listing of the fixed and dynamic circuits in the PPP multilink (MP) bundle, or enter the console process, for the specified dynamic circuit. Use this command without a qualifier to provide a summary listing of the links in the MP bundle, or with a qualifier to access the console prompt for a specific dynamic circuit.

Refer to Section 8.7 for details of the Link configuration and console commands.

Syntax: link *circuit#*

Example:

```
MPB>link 501
MP Link>
```

Example:

```
MPB>link
2 Links
Link Interface  MAC/Data-Link   Hardware                       Link State
500  MP/0       Multilink PPP   ISDN Basic Rate                Available
501  MP/1       Multilink PPP   V.25bis Dial Circuit           Available
```

Link	Identifies the link. For fixed links, this is the network interface number of the serial line or PPP-FR PVC pseudo device. For dynamic links this number identifies the network number of the MP Bundle device, and the dynamic circuit within the bundle. For example, Link 3 is a fixed PPP serial link and link 501 is a PPP Dial Circuit in the MP Bundle at interface 5.
Interface	Indicates the interface type and instance number of each link. The type is always MP.
MAC/Data-Link	Identifies the datalink protocol. It is always Multilink PPP.
Hardware	Describes the interface type and protocol of the link. It is set to `** No Base Net **` if the link has not been configured.
Link State	Indicates the state of the link.

List C

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

Syntax: list
- all
- authentication
- bncp
- ccp
- fixed
- frame-relay
- hdlc
- ipcp
- lcp
- mp
- parameters
- profiles

8.6 Point-to-Point Configuration and Console Commands

all

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

Note: This example shows all possible options and parameters for the PPP interface. Actual options listed depend on your configured interface. For example, the HDLC parameters do not apply to PPP-FR pseudo interfaces and the PPP Multilink Protocol Bundle options apply to MP Bundle devices only.

Example:

```
PPP config>list all
Maximum frame size in bytes = 2048
Encoding: NRZ
Idle State: Flag
Clocking: External
Cable type: Undefined
Reported 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
Authentication:            none

PPP Multilink Protocol Bundle Fixed Links (Bundle 5)
-------------------------------------------------------
Link 3     PPP-FR PVC Pseudo Device
Link 4     SCC Serial Line

PAP Parameters
--------------
Authent Request Tries:     20
Retry Timer:               3000
Request Timer:             15000
Repeat Author Timer        5

PAP Ids/Passwords
-----------------
Local ID:                  none
Local Password:            none

Remote ID:                 none
Remote Password:           none
```

8.6 Point-to-Point Configuration and Console Commands

```
CHAP Parameters
--------------
Authent Request Tries:     20
Retry Timer:               3000
Request Timer:             15000
Repeat Authent Timer       5

CHAP Ids/Passwords
-----------------
Local ID:                  none
Local Password:            none

Remote ID:                 none
Remote Password:           none

MP Options
--------------
Base Links:                         2
Max Links:                          6
Base idle timer:                   60
BoD threshold:                     70
BoD sample time:                   30
BoD base link line speed:       64000
BoD add link persistence:           5
BoD delete link persistence:       10
Default destination address name:    vremote

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

CCP Options
-----------
Data Compression: enabled
Algorithm: Stac-LZS
Stac: histories 1
Stac: check_mode SEQ
```

8.6 Point-to-Point Configuration and Console Commands

This section explains the information displayed by the example **list all** command.

Maximum frame size in bytes	Maximum frame size that can be received over the point-to-point link. This applies only to PPP serial interfaces or Multilink PPP bundles..
Encoding	HDLC transmission encoding scheme, either NRZ (non-return to zero) or NRZI (non-return to zero inverted). This applies only to PPP interfaces.
Idle State	Bit pattern, either Flag or Mark, transmitted on the point-to-point link when the interface is not transmitting data. This applies only to PPP serial interfaces.
Clocking	Indicates whether clocking is *Internal* or *External*. Clocking is *External* if the router has no clock.
Cable Type	Indicates the cable type. During configuration this is undefined.
Reported Clock Speed	The reported clock speed, in bits per second, as defined using the **set hdlc speed** command. This is used by SNMP to indicate the speed that the modem is operating at. The default is 0.
Transmit Delay Counter	Period of time set to elapse between the transmission of each frame. This applies only to PPP interfaces.
LCP Parameters	
Config Request Tries	Number of times LCP sends *configure-request* packets to a peer station while attempting to open a PPP link.
Terminate Tries	Number of times LCP sends *terminate-request* packets to a peer station to close a PPP link.
Config Nak Tries	Number of times LCP sends *configure-nak* (nak=not acknowledged) packets to a peer station while attempting to open a PPP link.
Retry Timer	Amount of time, in milliseconds, that elapses before LCP attempts to authenticate the remote station again.

8.6 Point-to-Point Configuration and Console Commands

LCP Options

Max Receive Unit	Maximum packet size that the link handles.
Magic Number	Indicates whether the “magic number” loopback detection option is enabled or disabled.
Authentication	Specifies which authentication protocol is used by the router to authenticate the link. CHAP, PAP, None, or Either are valid options. *Either* attempts to use CHAP first, and if not acceptable it selects PAP. The default is None.

PAP Parameters

Authentication 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.

CHAP Parameters

Authentication Request Tries	Number of times CHAP 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 CHAP attempts to authenticate the remote station again.
Request Timer	Amount of time, in milliseconds, that elapses before CHAP assumes that an authentication request is considered to have failed and CHAP terminates the link.
RepeatAuthentication Timer	Amount of time, in minutes, that elapses before CHAP repeats authentication. The default is zero (no repeat authentication).

CHAP Ids/ Passwords

Local ID	A text string that specifies the identifier of the local station. CHAP sends this string to the remote station to identify itself.
Local Password	A text string that specifies the password of the local station. CHAP compares the peer reply message to this string to authenticate the identifier.
Remote ID	A text string that specifies the identifier of the remote station.
Remote Password	A text string that specifies the password of the remote station. When CHAP receives a challenge from the authenticating station, it generates a reply based on the string.

MP Options

Base Links	The minimum number of links the router keeps open, providing the base bandwidth for the MP bundle. The default is one. If this number is greater than the number of fixed links that have been configured using the **set fixed add** command, the router opens dynamic links (Dial Circuits) to make up the difference.
Max Links	The maximum number of links the router can use for the multilink bundle. The difference between *Max Links* and the number of fixed links determines the number of dynamic link circuits in the bundle.

Base idle timer	The idle timer, in seconds, for the base link. It applies only to **demand** bundles. A demand bundle is a multilink PPP bundle with no fixed links, so the base link is a Dial Circuit. **0** – The first Dial Circuit in the base is brought up immediately and permanently. Additional base links are brought up a short time later and are also permanent. BoD links are brought up as needed and are subject to BoD timers. **1 to 65535 –** Initially no links are opened. When traffic arrives the first base link is brought up and times out when it has been idle for this number of seconds. Additional base links will operate only via bandwidth on demand.
BoD threshold	The level at which the router adds or subtracts bandwidth from the bundle. The default is 70% utilization.
BoD sample time	The period, in seconds, that the router uses to calculate the traffic load for bandwidth addition or deletion. The router samples the data rate every second. The default is 30.
BoD base link line speed	The router’s line speed for all links. The default is 64 Kbps.
BoD add link persistence	Number of seconds the router waits after determining that the bandwidth threshold has been exceeded on the base link before adding a secondary link. The default is five seconds.
BoD delete link persistence	Number of seconds the router waits after determining that the bandwidth has fallen below the threshold on the base link. The default is ten seconds.
Default destination address name	The network dial address of the remote router to which the link circuits will connect by default. Individual Link circuits can override this default.

NCP Parameters

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

Config Nak Tries	Number of times NCP sends *configure-nak* (nak=not acknowledged) packets to a peer station while attempting to open a PPP link.
Retry Timer	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 times out. Expiration of this timer causes a "timeout" and the halting of *configure-request* and *terminate-request* packet transmission.
IPCP Options	
IPCP Compression	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.
IP Address	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.
PPP Over Frame Relay Parameters	These parameters apply to PPP-FR pseudo interfaces only.
Frame Relay Interface Number	Indicates the interface number of the Frame Relay device that the PPP-FR device is using.
Frame Relay PVC DLCI Number	Indicates the circuit number of the Frame Relay PVC that the PPP-FR device is using. It is displayed as '`Network Assigned`' for PPP-FR Dial pseudo devices.
CCP Options	
Data Compression	Indicates whether the data compression option has been enabled or disabled.
Algorithm	Identifies the data compression algorithm that is in use. CCP currently uses Stac-LZS compression.
Stac: histories	Indicates the number of compression histories that CCP can keep track of. CCP is currently limited to 1 history.

Stac: check_mode	Indicates the form of data checking that is in use. CCP uses sequence number checking (SEQ), to ensure that compressed packets arrive in the correct order.

authentication

Both CHAP (Challenge Handshake Authentication Protocol) and PAP (Password Authentication Protocol) are authentication protocols for PPP interfaces. Local and remote authentication can be set to CHAP, PAP, either, or none. You can configure authentication parameters for both CHAP and PAP, including request attempts and timers used by the corresponding protocol. Enter the command at the `PPP config>` (or equivalent) prompt.

These fields are described under the **list all** command.

Example:

```
list authentication
PAP Parameters
--------------
Authent Request Tries:      20
Retry Timer:                3000
Request Timer:              15000
Repeat Author Timer         5

PAP Ids/Passwords
-----------------
Local ID:                   none
Local Password:             none

Remote ID:                  none
Remote Password:            none

CHAP Parameters
--------------
Authent Request Tries:      20
Retry Timer:                3000
Request Timer:              15000
Repeat Authentication Timer     5

CHAP Ids/Passwords
-----------------
Local ID:                   none
Local Password:             none

Remote ID:                  none
Remote Password:            none
```

8.6 Point-to-Point Configuration and Console Commands

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.

ccp

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

Example:

```
list ccp

CCP Options
-----------
Data Compression enabled
Algorithm: Stac-LZS
Stac: histories 1
Stac: check_mode SEQ
```

hdlc

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

Note: This command applies only to PPP interfaces.

Example:

```
list hdlc
Maximum frame size in bytes = 2048
Encoding: NRZ
Idle State: Flag
Clocking: External
Cable type: Undefined
Reported Clock Speed: 0

Transmit Delay Counter:    0
```

8.6 Point-to-Point Configuration and Console Commands

fixed

Lists the fixed links in an MP Bundle device. These fields are described under the **list all** command.

Note: This command applies only to MP Bundle interfaces.

Example:

```
list fixed
PPP Multilink Protocol Bundle Fixed Links (Bundle 5)
-------------------------------------------------------
Link 3     PPP-FR PVC Pseudo Device
Link 4     SCC Serial Line
```

frame-relay

Lists the Frame Relay interface number and PVC DLCI number associated with the PPP-FR pseudo interface. These fields are described under the **list all** command.

Note: This command applies only to PPP-FR pseudo interfaces.

Example:

```
list frame-relay
PPP Over Frame Relay Parameters
--------------------------------
Frame Relay interface number:          1
Frame Relay PVC DLCI number:          17
```

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
```

8.6 Point-to-Point Configuration and Console Commands

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
Authentication Protocol:  none                        Yes
```

mp

Lists the MP options for and MP bundle interface. These options are described under the **list all** command. This command is available only when configuring an MP Bundle device.

Example:

```
list mp
MP Options
--------------
Base Links:                        2
Max Links:                         6
BoD threshold:                    70
BoD sample time:                  30
BoD base link line speed:      64000
BoD add link persistence:          5
BoD delete link persistence:      10
Default destination address name:    vremote
```

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
```

profiles

This command is available only when configuring Multilink PPP Bundles. It lists the Telesaving profiles that have been configured for use by all the Dial Circuits in this Mutilink PPP Bundle.

Example:

```
list profiles
Profile(s) configured:
----------------------
    type: Initial Minimum Call Timer  name: DEFAULT
    type: Call Blocking  name: DEFAULT
    type: Call-Back   name: DEFAULT
```

Profiles configured Displays the three telesaving profiles configured for use by this Dial Circuit.

Type Identifies the type of telesaving profile:

Initial Minimum Timer

Call-Back or

Call Blocking

Name Displays the name of the telesaving profile configured for use by this Dial Circuit. The default profile in all cases is DEFAULT.

List **M**

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

frame-relay
ip
ipcp
ipx
ipxcp
osi
osicp
pap
chap
ccp
compression
mp
bod

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 that follows, specific fields are defined under the **list** command that displays that specific statistical group. For example, Error Type fields are explained under the **list error** command.

Note: This example shows all possible options and parameters for the PPP interface. There are additional parameters for MP Bundle devices and PPP-FR pseudo interfaces.

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

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

CHAP 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

BOD Statistic
-------------
Calls                  Bandwidth      Bandwidth
                       Added          Deleted
-----                  --------       --------
                          0              0
Current Avail BW:           128000 bps
Current Avail BW Usage:     0 %
Failed Calls:               0

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

CHAP Statistic        In                   Out
-------------         --                   ---
Packets:              0                    0
Octets:               0                    0
Auth Challenge:       0                    0
Auth Resp:            0                    0
Auth Success:         0                    0
Auth Failure:         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                 -

CCP State:                 Open
Previous State:            Ack Sent
Time Since Change:         10 minutes and 19 seconds
Local (transmit) compressor: Stac-LZS
    Negotiated histories: 1
    Negotiated check mode: SEQ

Remote (receive) decompressor: Stac-LZS
    Negotiated histories: 1
    Negotiated check mode: SEQ
 CCP State:                 Open
Previous State:            Ack Sent
Time Since Change:         10 minutes and 19 seconds

CCP Statistic              In                         Out
-------------              --                         ---
Packets:                   2                          2
Octets:                    18                         18
Reset Reqs:                0                          0
Reset Acks:                0                          0
Prot Rejects:              0                          -
Max size of transmit compression dictionary: 8398
Local (transmit) compressor: Stac-LZS
Local (transmit) compressor statistics:
    Recent compression ratio: 1.3:1
Size of receive decompression dictionary: 4424
Remote (receive) compressor: Stac-LZS
Remote (receive) decompressor statistics:
    Recent compression ratio: 1.4:1

Compression Statistic      In                         Out
---------------------      --                         ---
Packets:                   1                          1
Octets:                    54             56
Compressed Octets:         38             39
Incompressible Packets:    0               0
Discarded Packets:         0               0
Prot Rejects:                              -

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                     -
```

8.6 Point-to-Point Configuration and Console Commands

bod

Lists statistics for the Bandwidth on Demand feature. This command is available on Multilink PPP Bundle devices or Multilink PPP fixed link devices only.

Example:

```
list bod
BOD Statistic
Calls                     Bandwidth                 Bandwidth
                          Added                     Deleted
-----                     -----                     -------
                          0                         0

Current Avail BW:         128000 bps
Current Avail BW Usage:   0 %
Failed Calls:             14
```

BOD Statistic

Calls	The total number of calls made.
Bandwidth Added	The number of times added links have been brought up to increase the bandwidth
Bandwidth Deleted	The number of times added links have been dropped.
Current Avail BW	The total bandwidth of all currently active links.
Current Avail BW Usage	The current bandwidth utilization, expressed a percentage of the currently available bandwidth. If this figure approaches the BoD threshold, bandwidth is increased by opening another dynamic link circuit.
Failed Calls	The number of call requests that have failed.

8.6 Point-to-Point Configuration and Console Commands

ccp

Lists statistics for the Compression Control Protocol.

Example:

```
list ccp
CCP Statistic             In                         Out
-------------             --                         ---
Packets:                  2                          2
Octets:                   18                         18
Reset Reqs:               0                          0
Reset Acks:               0                          0
Prot Rejects:             0                          -
Max size of transmit compression dictionary: 20368
Local (transmit) compressor: Stac-LZS
Local (transmit) compressor statistics:
    Recent compression ratio: 1.3:1
Size of receive decompression dictionary: 4152
Remote (receive) compressor: Stac-LZS
Remote (receive) decompressor statistics:
    Recent compression ratio: 1.4:1
```

CCP Statistic

Packets	Displays the total number of CCP control packets transmitted (out) and received (in) over the current point-to-point interface.
Octets	Displays the total number of bytes (in octets) of data in the CCP control packets transmitted and received over the current point-to-point interface.
Reset Reqs	Displays the total number of reset request packets transmitted and received over the current point-to-point interface. CCP issues a Reset Request when a compressed packet is lost.
Reset Acks	Displays the total number of reset acknowledgement packets transmitted and received over the current point-to-point interface. CCP issues a Reset Acknowledgement in response to a Reset request. The sequence numbers are then reset. Intervening packets are lost.
Prot Rejects	Displays the total number of protocol-reject packets transmitted and received over the current point-to-point interface.

Max size of transmit compression dictionary	Memory allocated to the compressor for maintaining transmitted data compression history.
Local (transmit) compressor	The algorithm being used for data compression. CCP currently uses Stac-LZS data compression only.
Local (transmit) compressor statistics	The compression ratio that has been observed in the recent sequence of packets. The ratio is calculated by comparing the number of compressed octets transmitted to the original number of octets to be transmitted.
Size of receive decompression dictionary	Memory allocated to the decompressor for maintaining received data compression history.
Remote (receive) compressor	The algorithm being used for data decompression. CCP currently uses Stac-LZS data decompression only.
Remote (receive) decompressor statistics	The compression ratio that has been observed in the recent sequence of packets. The ratio is calculated by comparing the number of compressed octets received to the number of decompressed octets.

chap

Lists statistics for the Challenge Handshake Authentication Protocol (CHAP).

Example:

list chap

```
CHAP Statistic       In          Out
-------------        --          ---
Packets:             0           0
Octets:              0           0
Auth Req:            0           0
Auth Ack:            0           0
Auth Nak:            0           0
```

CHAP Statistic

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

Octets — Displays the total number of bytes of CHAP 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.

compression

Lists statistics for the compressed packets that have been exchanged.

Example:

```
list compression
Compression Statistic      In                         Out
---------------------      --                         ---
Packets:                   1                          1
Octets:                    54                         56
Compressed Octets:         38                         39
Incompressible Packets:    0                          0
Discarded Packets:         0                          0
Prot Rejects:              0                          -
```

Compression Statistic

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

Octets — Displays the total number of bytes (in octets) of data before being compressed for transmission and after being decompressed when received over the current point-to-point interface.

Compressed Octets — Displays the total number of bytes (in octets) of compressed data in the packets transmitted and received over the current point-to-point interface.

Incompressible Packets	Displays the total number of packets that could not be compressed. If data that has already been compressed is being transmitted, then compression can actually make the data grow. If the packet size exceeds the Max Receive Unit for the LCP, then CCP sends the data uncompressed. If this counter increases, no data is lost, but performance is reduced because of the Reset Requests.
Discarded Packets	Displays the total number of bytes (in octets) of discarded packets transmitted and received over the current point-to-point interface.
Prot Rejects	Displays the total number of *protocol-reject* packets transmitted and received over the current point-to-point interface.

control

atcp
bncp
lcp
pap
chap
ipcp
dncp
ipxcp
osicp
ccp
mp

Lists information and counters related to the specified control protocol.

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 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

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

Example:

```
list control ccp
CCP State:                  Open
Previous State:             Ack Sent
Time Since Change:          10 minutes and 19 seconds

Local (transmit) compressor: Stac-LZS
    Negotiated histories: 1
    Negotiated check mode: SEQ

Remote (receive) decompressor: Stac-LZS
    Negotiated histories: 1
    Negotiated check mode: SEQ
```

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

Local (transmit) compressor	The algorithm being used for data compression. CCP currently uses Stac-LZS data compression only.
Negotiated histories	The number of Stac-LZS data compression histories that CCP can keep track of at any one time. CCP currently supports only 1 history per PPP link.
Negotiated check mode	The data validation method in use by CCP. CCP adds a sequence number (SEQ) to each packet to ensure that compressed packets arrive in the correct order.
Remote (receive) decompressor	The algorithm being used for data decompression. CCP currently supports Stac-LZS data decompression only .
Negotiated histories	The number of Stac-LZS data decompression histories that CCP can keep track of at any one time. CCP currently supports only 1 history per PPP link.
Negotiated check mode	The data validation method in use by CCP. CCP checks the sequence number (SEQ) of each received packet to ensure that compressed packets arrive in the correct order.

8.6 Point-to-Point Configuration and Console Commands

Example:

`list control chap`

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

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

Remote ID:          FOO
Remote Password:    BAR
```

State — Displays the current state of the authentication protocol. These states include the following:

- **Closed –** 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.
- **Closing** – Indicates that authentication has failed and the link is in the termination process.

State (continued)

- **Listen** – Indicates that the local station is waiting for an authentication challenge from the remote station.
- **Challenge Sent** – The local station has sent a challenge and is waiting for a response.
- **Response Sent –** The local station has sent a response and is waiting for a success/failure.
- **Success Sent** – The local station has verified authentication.
- **Success Received** – The local station has received verification.
- **Opened** – Authentication is complete and link establishment is proceeding.

Previous State — Displays the state of the protocol prior to the state displayed in the State field. These states are the same as those described in CHAP *State* above.

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

CHAP Ids/Passwords

Local ID	A text string that specifies the identifier of the local station. CHAP sends this string to the remote station to identify itself.
Local Password	A text string that specifies the password of the local station. CHAP compares the peer reply message to this string to authenticate the identifier.
Remote ID	A text string that specifies the identifier of the remote station.
Remote Password	A text string that specifies the password of the remote station. When CHAP receives a challenge from the authenticating station, it generates a reply based on the string.

Example:

list control dncp

```
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 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

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

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 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:    No                         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.

Async CharMask Not currently supported. PPP accepts this option but ignore it.

Authentication Displays the authentication protocol that is used.

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

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

Address/Cntl Compr 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.

8.6 Point-to-Point Configuration and Console Commands

Example:

```
list control mp
MP Options
--------------
Base Links:                         2
Max Links:                          6
Active Links:                       2
Endpoint Class:                     3
Remote Endpoint ID:         AA55EE8ED980
Max Rcv Reconst Unit:            2848
BoD sample time:                   30
BoD base link line speed:       64000
BoD add link persistence:           5
BoD delete link persistence:       10
```

MP Options

Base Links	Number of links the router opens as a base for an MP bundle. The default is one.
Max Links	The maximum number of links the router can use for the multilink bundle. The difference between *Max Links* and the number of fixed links determines the number of dynamic link circuits in the bundle.
Active Links	The number of links currently active.
Endpoint Class	Identifies the class of system transmitting packets. This is used for endpoint discrimination to ensure that all links joining the MP bundle are from the same peer system. The classes indicate the type of addressing used for the unique *Endpoint ID* as follows:

- **0** – Indicates that Endpoint discrimination is not being used.
- **1** – Locally assigned address, for example device serial number.
- **2** – Internet Protocol (IP) Address.
- **3** – MAC Address.
- **4** – PPP Magic number block.
- **5** – Public Switched Network Directory number.

Remote Endpoint ID	Uniquely identifies the remote system. The ID format depends on the Endpoint Class.
Max Rcv Reconst Unit	Maximum Receive Reconstruction Unit specifies the maximum number number of octets in the information fields of reassembled packets. It must be large enough to accept packets up to the size of the MRU LCP option in PPP.
BoD sample time	The number of seconds the router uses as a basis for establishing a history of line usage. The default is 30.
BoD base link line speed	The router's line speed for the base link. The default is 64000.
BoD add link persistence	Number of seconds the router waits after determining that the bandwidth threshold has been exceeded on the base link before adding a secondary link. The default is five seconds.
BoD delete link persistence	Number of seconds the router waits after determining that the bandwidth has fallen below the threshold on the base link. The default is ten seconds.

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.

Example:

```
list control 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
```

PAP State

Displays the current state of the authentications protocol. These states include the following:

- **Closed** – 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.
- **Closing** – Indicates that authentication has failed and the link is in the termination process.
- **Listen –** Indicates that the local station is waiting for an authentication request from the remote station.
- **Req Sent** – The local station has sent the authentication request containing the local ID and password. The remote station has not responded.
- **Ack Rcvd –** local station has received positive acknowledgement for its ID and password.
- **Ack Sent –** The local station has received the remote station's ID and password and has sent acknowledgement.
- **Opened –** Authentication is complete and link establishment is proceeding.

Previous State

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 *PAP State* above.

Time Since Change

Displays the amount of time the link is in the present state.

PAP Ids/Passwords

Local ID

The identifier string sent by the local station in an authentication request packet.

Local Password

The password string sent by the local station in an authentication request packet.

Remote ID

The identifier string expected by the local station when an authentication request packet is received.

Remote Password	The password string expected by the local station when an authentication request packet is received.

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 dncp
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

Bad Address	Displays the total number of bad addresses encountered over the point-to-point link.
Bad Control	Displays the total number of bad control packets encountered over the point-to-point link.
Unknown Protocol	Displays the total number of unknown protocol packets encountered by the current link.
Invalid Protocol	Displays the total number of invalid protocol packets encountered by the current link.
Config Timeouts	Displays the total number configuration timeouts experienced by the link.
Terminate Timeouts	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.

Note: This command applies only to the PPP-FR PVC pseudo interface.

Example:

```
list frame-relay
Frame Relay PVC Statistics
--------------------------

Frame Relay Interface Number: 2
                                                        Frames         Frames
 Circuit#        Circuit Name        State      Transmitted    Received
 --------  --------------------- ------------  ----------   ----------
    100    PPP Pseudo Net 8        Inactive       2384850        71717
```

Frame Relay Interface Number	Indicates the network number of the Frame Relay interface.
Circuit Number	Indicates the DLCI number of the configured PVC at the local Frame Relay interface.

Circuit Name	Indicates the ASCII designation of the configured PVC at the local Frame Relay interface. This name is set to *PPP Pseudo Net* for all PPP-FR circuits.
State	Indicates the current state of the circuits (*Active, Inactive* or *Congested*).
Frames Transmitted	Indicates the total number of frames transmitted over the current PPP-FR pseudo interface.
Frames Received	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

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 of IP data, in octets, transmitted and received over the current point-to-point interface.
Prot Rejects	Displays the total number of *protocol-reject* packets transmitted and received over the current point-to-point interface.

8.6 Point-to-Point Configuration and Console Commands

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
Ipcp 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                   -
```

8.6 Point-to-Point Configuration and Console Commands

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.

Cfg Ack — Displays the total number of *configure-ack* (acknowledged) packets transmitted and received over the current point-to-point interface.

Cfg Nak — Displays the total number of *configure-nak* (not acknowledged) packets transmitted and received over the current point-to-point interface.

Cfg Rej — Displays the total number of *configure-reject* packets transmitted and received over the current point-to-point interface.

Term Req	Displays the total number of *terminal-request* packets transmitted and received over the current point-to-point interface.
Term Ack	Displays the total number of *terminal-ack* (acknowledged) packets transmitted and received over the current point-to-point interface.
Echo Req	Displays the total number of *echo-request* packets transmitted and received over the current point-to-point interface.
Echo Resp	Displays the total number of *echo-response* packets transmitted and received over the current point-to-point interface.
Disc Req	Displays the total number of *discard-request* packets transmitted and received over the current point-to-point interface.
Code Rej	Displays the total number of *code-reject* packets transmitted and received over the current point-to-point interface.

mp

Lists statistics for the MP control protocol. These fields are the same as those described under the **list ip** command. This command is available on Multilink PPP devices (bundles, fixed links or link circuits) only.

Example:

```
list mp
MP Statistic             In                  Out
--------------           --                  ---
Packets:                 0                   0
Octets:                  0                   0
Prot Rejects:            0                   -
```

8.6 Point-to-Point Configuration and Console Commands

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 (PAP).

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
```

PAP Statistic

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.

Profile-list C

This command applies only to Multilink PPP Bundle devices.

It displays the telesaving profiles which have been configured on the router using the Tel feature. This command is used to display the available profile definitions before you use the **set** command to select the profiles which will be used by all Dial Circuits in the MP Bundle.

Refer to Chapter 14 for details about configuring telesaving profiles using the Telesaving feature.

Syntax: profile-list
- blocking
- call-back
- initial-minimum-timer

blocking

Displays the call blocking telesaving profiles.

Example:

```
profile-list blocking
LIST profile(s) - BLOCKING                     * = current active action
Enter profile name, or ALL (1 to 15 characters):   []? all
========================================================================
Type                     Name             Default Blocking
----                     ----             ----------------
BLOCKING                 DEFAULT         *Action :- NONE
                                          Clear Active Calls :- DISABLE
```

```
No bands defined

========================================================================
Type                     Name               Default Blocking
----                     ----               ----------------
BLOCKING                 CBLK01             Action :- BOTH
                                            Clear Active Calls :- ENABLE

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     NONE
 2    SATURDAY   SATURDAY    08:30       12:00     NONE


*** End of profile listing ***
```

List profile(s) BLOCKING. This is a call-blocking profile.

Enter profile name Specify the name of the call blocking profile you want to list, or **ALL** to display all call blocking profiles.

Type Indicates the type of profile being displayed. BLOCKING indicates that this is a call-blocking profile.

Name Indicates the name used to identify this profile. The name has 1 to 15 characters.

Default Blocking

Action The default call blocking action which is used if none of the configured bands apply.

- **None –** Allow incoming and outgoing calls.
- **Incoming** – Do not accept incoming calls.
- **Outgoing** – Do not allow outgoing calls.
- **Both** – Do not allow incoming or outgoing calls.

The asterisk (*) indicates that this is the currently active action.

Clear Active Calls Indicates whether active calls will be cleared when this band becomes active.

- **Enable** – Active calls, in the direction specified by *Action*, will be cleared when this band becomes active.
- **Disable** – Active calls will not be cleared when this band becomes active.

Band	Indicates the sequence number of the timeband defined within each profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number. The asterisk (*) indicates that this is the currently active band.
Start Day	Indicates the day of the week on which this timeband begins.
End Day	Indicates the day of the week on which this timeband ends.
Start Time	Indicates the time of day at which this timeband begins. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.
End Time	Indicates the time of day at which this timeband ends. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.
Action	Indicates the call blocking action which is used when this timeband is active. **None –** Allow incoming and outgoing calls. **Incoming** – Do not accept incoming calls. **Outgoing** – Do not allow outgoing calls. **Both –** Do not allow incoming or outgoing calls.
List profile(s)	BLOCKING. This is a call-blocking profile.

call-back

Displays the call-back telesaving profiles.

Example:

```
profile-list call-back
LIST profile(s) - CALL-BACK                    * = current active action
Enter profile name, or ALL (1 to 15 characters):   []? clb01
========================================================================
Type                      Name                Default Call-Back
----                      ----                -----------------
CALL-BACK                 CLB01               Action :- NONE
                                              Delay ms 1000
                                              Wait seconds 20

Band  Start Day  End Day     Start Time  End Time  Action
```

```
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     ACCEPT
 2    SATURDAY   SATURDAY    08:30       12:00     ACCEPT

*** End of profile listing ***
```

List profile(s) CALL-BACK. This is a call-back telesaving profile.

Enter profile name Specify the name of the call-back profile you want to list, or **ALL** to display all call-back profiles.

Type Indicates the type of profile being displayed. CALL-BACK indicates that this is a call-back profile.

Name Indicates the name used to identify this profile. The name has 1 to 15 characters.

Default Call-Back

Action The default call back action which is used if none of the configured bands apply.

None – Do not use call back.

Accept – Call back the remote station when monitoring incoming calls.

Request – Request call-back from remote station on outgoing calls.

The asterisk (*) indicates that this is the currently active action.

Accept Delay Indicates the the default interval, in milliseconds, that the acceptor waits before redialing when calling back to the remote station.

The range is 100 to 5000 milliseconds, and the default value is 1000 milliseconds.

Wait Indicates the default interval, in seconds, that the Receiver waits for a remote station to respond to an outgoing call which requests call-back.

The range is 5 to 120 seconds and the default value is 20 seconds.

Band Indicates the sequence number of the timeband defined within each profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number.

The asterisk (*) indicates that this is the currently active band.

Start Day	Indicates the day of the week on which this timeband begins.
End Day	Indicates the day of the week on which this timeband ends.
Start Time	Indicates the time of day at which this timeband begins. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.
End Time	Indicates the time of day at which this timeband ends. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.
Action	Indicates the call back action which is used when this timeband is active. **None –** Do not use call back. **Accept** – Call back the remote station when accepting incoming calls. **Request –** Request call-back from remote station on outgoing calls.
List profile(s)	CALL-BACK. This is a call-back telesaving profile.

initial-minimum-timer

Displays the initial minimum timer telesaving profiles.

Example:

```
profile-list initial-minimum-timer
LIST profile(s)-INITIAL-MINIMUM-TIMER     * = current active timer
Enter profile name, or ALL (1 to 15 characters):   []? all
=======================================================================
Type                      Name                Default Timer(secs)
----                      ----                -------------------
INITIAL-MINIMUM-TIMER     DEFAULT             00090

Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
 1    MONDAY     FRIDAY      00:00       24:00     00050
*2    MONDAY     FRIDAY      08:00       18:00     00030
========================================================================
Type                      Name                Default Timer(secs)
----                      ----                -------------------
INITIAL-MINIMUM-TIMER     IMCT01              00120
```

```
Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:00       19:00     00060
 2    SATURDAY   SATURDAY    00:00       24:00     00090

*** End of profile listing ***
```

List profile(s) INITIAL-MINIMUM-TIMER. This is an initial minimum timer profile.

Enter profile name Specify the name of the initial minimum timer profile you want to list, or **ALL** to display all initial minimum timer profiles.

Type Indicates the type of profile being displayed. INITIAL-MINIMUM-TIMER indicates that this is an initial minimum timer profile.

Name Indicates the name used to identify this profile. The name has 1 to 15 characters.

Default Timer Indicates the default minimum time, in seconds, that calls will be connected. This timer is used when no other timeband in the profile is active.

Band Indicates the sequence number of each timeband in the profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number.

The asterisk (*) indicates that this is the currently active band.

Start Day Indicates the day of the week on which this timeband begins.

End Day Indicates the day of the week on which this timeband ends.

Start Time Indicates the time of day at which this timeband begins. The format is *hh:mm,* where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.

End Time Indicates the time of day at which this timeband ends. The format is *hh:mm,* where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.

Timer Indicates the minimum time, in seconds, that calls will be connected when this timeband is active.

8.6 Point-to-Point Configuration and Console Commands

Set **C**

Sets HDLC parameters (PPP serial interface only), LCP options and parameters, IPCP options, BNCP options, Frame Relay parameters (PPP-FR pseudo interface only), PAP and CHAP parameters and ID's/Passwords, and NCP parameters. Parameters affect only the interface that you are configuring.

For MP Bundle devices this command is also used to set the fixed links and dynamic link circuits (Dial Circuits) in the bundle and specify which telesaving profiles are to be used by the Dial Circuits. When using the **set** command to configure an MP Bundle, the options affect all links in the bundle.

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 a 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
- authentication
- bncp
- ccp . . .
- fixed
- frame-relay
- hdlc
- ipcp . . .
- lcp . . .
- mp
- parameters . . .
- blocking
- call-back
- initial-minimum-call-timer

8.6 Point-to-Point Configuration and Console Commands

authentication

Sets the authentication parameters and ID's/Passwords for the CHAP and PAP authentication protocols. Use the **set authentication** command to set up records for both the local and remote devices. Enter the command at the `PPP config>` prompt.

Syntax: set authentication
local ...
remote ...
parameters ...

Example:

```
set authentication local chap
Local ID: [default]: new ID
Local Password:      none
```

Example:

```
set authentication local pap
Local ID: [default]: new ID
Local Password: [none]
```

Local ID — A text string that specifies the identifier of the local station. CHAP and PAP send 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 if the remote station requests authentication. If CHAP authentication is enabled it uses this string to generate an authentication challenge to the remote station and to compare with the remote's response. The string can be any combination of up to 255 alphanumeric characters.

Example:

```
set authentication remote chap
Remote ID []:
Remote Password []:
```

Example:

```
set authentication remote pap
Remote ID []:
Remote Password []:
```

Remote ID	A text string that specifies the identifier of the remote station. If this station has PAP authentication enabled then it requests a PAP ID string and password from the remote station. The received ID string is compared with this value. A mismatch results in authentication failure. CHAP uses the remote ID to generate a response to an authorization challenge from the remote station. 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. PAP uses this string to authenticate passwords received from the remote station. CHAP uses this string to generate a response to a challenge. The string can be any combination of up to 255 alphanumeric characters.

Example:

```
set authentication parameters pap
```

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

```
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.

Example:

`set authentication parameters chap`

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

```
Request tries   [20]?
Retry timer (mSec)   [3000]?
Request timer (mSec)   [15000]?
Repeat Authentication Timer (min) [0]?
```

Request tries	Sets the number of *authentication-request* packets CHAP 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 CHAP 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 CHAP assumes an authentication request is considered to have failed and CHAP terminates the link. The range is 200 to 150000 milliseconds. The default is 15000 milliseconds.
Repeat Authentication Timer	Amount of time, in minutes, that elapses before CHAP repeats authentication. The default is zero (no repeat authentication).

bncp

Sets Bridging Network Control Protocol (BNCP) parameters.

Example:

`set bncp`

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

8.6 Point-to-Point Configuration and Console Commands

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.

ccp *state*

Allows you to specify whether Compression Control Protocol (CCP) is enabled or disabled at startup. You must enable CCP at both ends of the link in order to use CCP compression.

State is either enabled or disabled. The default is disabled.

Example:

```
set ccp enable
CCP compression was disabled, now enabled.
```

fixed

Sets the fixed lines (leased line or PPP-FR pseudo devices) in a MP bundle. Use the **set fixed** command to add or delete fixed lines. Enter the command at the `MPB config>` prompt.

Syntax: set fixed
add ...
delete ...

Example:

```
set fixed add
Link [1-32]  [0]?
```

Adds the specified leased line interface or PPP-FR PVC pseudo device to the MP Bundle. The datalink of the specified device must already be set to Multilink PPP, using the **set data-link multilink-ppp** command at the `Config>` prompt.

Example:

```
set fixed delete
Link [1-32]  [0]?
```

Deletes the specified device from the MP Bundle.

frame-relay

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

Note: This command is not applicable to PPP interfaces or PPP-FR Dial pseudo devices.

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]?
```

Frame Relay interface number	Indicates the number of the Frame Relay Interface which the PPP-FR interface is to use.
Frame Relay PVC DLCI Number	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. 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.
Committed Information Rate (CIR)	Indicates the committed information rate (CIR) in a range of 300 bps to 2048000 bps. The default is 64000 bps.
Committed Burst Size (Bc)	Indicates the number of the committed burst size (Bc) in a range of 300 bps to 2048000 bps. The default is 64000 bps.
Excess Burst Size (Be)	Indicates the number of the excess burst size (Be) in a range of 0 bps to 2048000 bps. The default is 0 bps.

8.6 Point-to-Point Configuration and Console Commands

hdlc

Sets the HDLC options. Enter the command at the `PPP config>` prompt.

Syntax: set hdlc

encoding *nrz* or *nrzi*
frame-size *size*
idle *flag* or *mark*
speed *speed*
transmit delay *microseconds*

Example:

```
set hdlc encoding 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 frame-size
Frame Size [1500]? 4088
```

Sets the maximum frame size, in bytes, that can be received over the datalink, in the range 576 to 4088.

Example:

```
set hdlc idle flag
```

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

Example:

```
set hdlc speed
Reported Clock Speed [0]?64000
```

Sets the reported clock speed, in bits per second. This is used by SNMP to indicate the speed that the modem is operating at. The default is 0.

Example:

```
set hdlc transmit-delay 30
```

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

8.6 Point-to-Point Configuration and Console Commands

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]:
```

IP 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 you are configuring.

Example:

```
set lcp options
Maximum Receive Unit (bytes) [2048]?
Magic Number [yes]:
Set MRU default high [no]:
Authentication Protocol (None, Pap, Chap, Either) [none]: either
No CHAP Local ID/Password configured.
```

```
CHAP Local ID : 555 321-6789
CHAP Local Password : chapcheck
PAP Remote ID [555 888-1234]: 555 797-9557
PAP Remote Password [oldpappwd]: newpappwd
```

Maximum receive unit Sets the maximum 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.

Set MRU default high Specifies whether the router can override the MRU. This is required only for routers, such as the DECBrouter 90 and some third party products, which do not support MRU values over 1500 bytes. Setting this value to Yes enables the MRU default high option, allowing the router to operate as if the MRU were 2048. Setting this value to No disables the option. The default is No.

Authentication Protocol Specifies which authentication protocol is used by the router to authenticate the link. CHAP, PAP, None, or Either are valid options. *Either* attempts to use CHAP first, and if not acceptable it selects PAP. The default is None.

CHAP Local ID A text string that specifies the CHAP identifier of the local station. You will get this prompt only if you are enabling *CHAP* or *Either* authentication.

The default is the previously defined value.

CHAP Local Password A text string that specifies the CHAP password of the local station.You will get this prompt only if you are enabling *CHAP* or *Either* authentication. This password is used to generate an authentication challenge to the remote station.

The default is the previously defined value.

PAP Remote ID A text string that specifies the PAP identifier you expect to receive from the remote station.You will get this prompt only if you are enabling *PAP* or *Either* authentication.

The default is the previously defined value.

PAP Remote Password A text string that specifies the PAP password you expect to receive from the remote station.You will get this prompt only if you are enabling *PAP* or *Either* authentication.

The default is the previously defined value.

Example:

set lcp parameters

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

Config tries 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.

The retry timer starts after the first *configure-request* packet is transmitted. This is done to guard against packet loss.

NAK tries 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.

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.

8.6 Point-to-Point Configuration and Console Commands

Terminate tries — 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.

The retry timer starts after the first terminate-request packet is transmitted. This is done to guard against packet loss.

Retry timer — 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.

mp

Sets Multilink Protocol (MP) and Bandwidth on Demand (BoD) options.

Example:

```
set mp
Base Links:                   [1]?
Max Links:                    [2]?
BoD threshold:                [70]?
BoD sample time:              [30]?
BoD base link line speed:     [64000]?
BoD add link persistence:     [5]?
BoD delete link persistence:  [10]?
Default destination address name:
```

Base Links — Minimum number of links the router keeps open, providing a base bandwidth for the MP bundle. The default is one.

If this number is greater than the number of fixed links that have been configured using the **set fixed add** command, the router opens dynamic links (Dial Circuits) to make up the difference.

Max Links — The maximum number of links the router can use for the multilink bundle. The difference between *Max Links* and the number of fixed links determines the number of dynamic links in the bundle.

BoD threshold — The level at which the router adds or subtracts bandwidth from the line. The default is 70% utilization.

BoD sample time	The number of seconds the router uses as a basis for establishing a history of line usage. The default is 30.
BoD base link line speed	The line speed in bits/sec for all the links of the MP bundle. The default is 64000, indicating the router is using multiple 64 Kbps channels in the bundle. For BoD to function correctly, all links in the bundle *must* have identical line speed.
BoD add link persistence	Number of seconds the router waits after determining that the bandwidth threshold has been exceeded on the base link before adding a secondary link. The default is five seconds.
BoD delete link persistence	Number of seconds the router waits after determining that the bandwidth has fallen below the threshold on the base link. The default is ten seconds.
Default destination address name	The network dial address of the remote router to which the Dial Circuit will connect.

parameters

Sets parameters for all Network Control Protocols.

Example:

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

blocking

This command applies only to Multilink PPP Bundle devices. It specifies the call blocking profile that the Dial Circuits in the bundle will use.

Refer to Chapter 14 for details about configuring telesaving profiles using the Telesaving feature.

Example:

```
set blocking
Enter profile name, or NONE (1 to 15 characters):   [DEFAULT]?
```

8.6 Point-to-Point Configuration and Console Commands

call-back

This command applies only to Multilink PPP Bundle devices. It specifies the call-back profile that the Dial Circuits in the bundle will use.

Refer to Chapter 14 for details about configuring telesaving profiles using the Telesaving feature.

Example:

```
set call-back
Enter profile name, or NONE (1 to 15 characters):   [DEFAULT]?
```

initial-minimum-timer

This command applies only to Multilink PPP Bundle devices. It specifies the initial-minimum-timer profile that the Dial Circuits in the bundle will use.

Refer to Chapter 14 for details about configuring telesaving profiles using the Telesaving feature.

Example:

```
set initial-minimum-timer
Enter profile name, or NONE (1 to 15 characters):   [DEFAULT]?
```

Exit C M

Returns to the previous prompt level.

Syntax: exit

Example:

```
exit
```

8.7 PPP Multilink Link Circuit Configuration and Console Commands

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

Table 8–3 lists the link circuit configuration commands.

Table 8–3 Link Circuit Configuration Commands Summary

Command	Task	Function
? (Help)	Configure/ Monitor	Lists the configuration commands or lists the options associated with that command.
Delete	Configure	Deletes the inbound call settings from the link circuit configuration.
List	Configure/ Monitor	Displays the link circuit configuration parameters.
Set	Configure	Configures the link circuit for inbound or outbound calls, maps the link circuit to a network interface, and sets addresses and self-test delay.
Exit	Configure/ Monitor	Exits the link circuit configuration process and returns to the PPP `Config>` prompt.

? (Help) C M

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

Syntax: ?

Example:

```
?
DELETE
LIST
SET
EXIT
```

8.7 PPP Multilink Link Circuit Configuration and Console Commands

Example:

```
Set ?
NET
CALLS
DESTINATION
INBOUND DESTINATION
ANY_INBOUND
SELFTEST-DELAY
SEND_LINE_ID
```

Delete C

Remove the inbound call settings from the link circuit configuration.

Syntax: delete inbound destination

delete inbound destination

Removes both the inbound destination and the any_inbound settings from the link circuit configuration. This causes the link circuit to accept calls only from callers that have a network number that matches the destination parameter.

Example:

```
delete inbound
```

List C

Display the current link circuit configuration.

Syntax: list

Example:

```
list
Base net:                     1
Destination name:             remote-site-baltimore
Inbound dst name:                 * ANY *
Outbound calls:               allowed
Inbound calls:                allowed
SelfTest Delay Timer =        150 ms
Send Line ID:                 NO
Committed Information Rate:   64000
Committed Burst Size:         64000
Excess Burst Size:            0
```

Base net: Name of the network interface to which this link circuit is mapped.

8.7 PPP Multilink Link Circuit Configuration and Console Commands

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.
Inbound dst name:	If the circuit is configured to accept inbound calls that do not match any other addresses this field displays `* ANY *`. When configured to a name this is used as an alternate comparison address name used by the caller-ID mechanism for inbound calls.
Outbound calls	Displays this parameter when the circuit is configured to initiate outbound calls.
Inbound calls	Displays this parameter when the circuit is configured to accept inbound calls.
SelfTest Delay Timer	Displays the self-test delay timer setting in milliseconds. The range is 0 to 65535; 0 indicates no delay.
Send Line ID	Displays whether proprietary local ID messages are sent. Options are yes or no. The default is no.
Committed Information Rate	Indicates the committed information rate (CIR) that will be requested in an outbound call or that will be expected in an inbound call. This is displayed only if the *Base net* is a Frame Relay interface.
Committed Burst Size	Indicates the maximum amount of committed data that the SVC can transmit. This value will be requested in an outbound call or will be expected in an inbound call. This is displayed only if the *Base net* is a Frame Relay interface.
Excess Burst Size	Indicates the maximum allowed amount of uncommitted data for the SVC. This value will be requested in an outbound call or will be expected in an inbound call. This is displayed only if the *Base net* is a Frame Relay interface.

8.7 PPP Multilink Link Circuit Configuration and Console Commands

List M

Display information and counters related to the Multilink point-to-point link interface and PPP parameters and options. See the description of the PPP console **List** command in Section 8.6 for a full description of these parameters.

Syntax: list

- all
- ap2
- atcp
- bncp
- control . . .
- dn
- dncp
- errors
- frame-relay
- ip
- ipcp
- ipx
- ipxcp
- osi
- osicp
- pap
- chap
- ccp
- compression
- mp
- bod

8.7 PPP Multilink Link Circuit Configuration and Console Commands

Set **C**

Map the link circuit to a base network interface; configure the link circuit for inbound and/or outbound calls; and set destination addresses, inbound addresses and self-test delay.

Syntax: set

net...
calls...
destination...
inbound destination...
any_inbound
selftest-delay...
send_line_id...

net ***# of interface***

Specifies the number of the network interface to which you want to map this circuit. The network interface may be a serial line(V.25 *bis*), an ISDN network interface, a Frame Relay network interface or a Frame Relay Dial Circuit over ISDN.

Example:

```
set net 2
```

When the circuit is mapped to a Frame Relay interface the command prompts for Frame Relay data rates. Incoming calls will not be accepted unless they propose call rates which match this configuration.

Example:

```
set net 1
Committed Information Rate (CIR) in bps [64000]?
Committed Burst Size (Bc) in bits [64000]?
Excess Burst Size (Be) in bits [0]?
```

Committed Information Rate	Defines the committed information rate (CIR) that will be requested in an outbound call or that will be expected in an inbound call. The range is 300 bps to 2048000 bps. The default is 64 Kbps.

Committed Burst Size (Bc)	Defines the maximum amount of committed data that the SVC can transmit. This value will be requested in an outbound call or will be expected in an inbound call. The range is 300 bps to 2048000 bps. The default is 64 Kbps.
Excess Burst Size (Be)	Defines the maximum allowed amount of uncommitted data for the SVC. This value will be requested in an outbound call or will be expected in an inbound call. The range is 0 bps to 2048000 bps. The default is 0 bps.

calls ***outbound*** *or* ***inbound*** *or* ***both***

Restricts this link 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 link circuit to operate. It specifies the network dial address of the remote router to which this link circuit will connect. The caller-ID protocol uses this parameter as the default comparison address for incoming calls. This parameter must match a remote address name that you assigned at the `Config>` prompt using the:

- **add v25-bis-address** command for V.25 *bis* interfaces
- **add isdn-address** command for ISDN interfaces
- **add frame-relay-address** command for Frame Relay SVCs used by PPP-FR Dial pseudo devices

Note: This parameter is not required for V.25 *bis* interfaces operating in DTR dialing mode. The modem must be configured to automatically dial the remote address.

Example:

set destination vremote

inbound destination ***address name***

Set this parameter if the link 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 the local address name that you assigned at the `Config>` prompt using the:

- **add v25-bis-address** command for V.25 *bis* interfaces
- **add isdn-address** command for ISDN interfaces
- **add frame-relay-address** command for Frame Relay SVCs used by PPP-FR Dial pseudo devices

Example:

set inbound remote-site-1

any_inbound

Specifies that inbound calls that do not match any other link circuit are mapped to this circuit and accepted as inbound calls.

Example:

set any_inbound

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.

send_line_id ***yes*** *or* ***no***

Specifies whether proprietary local id messages are sent. Options are yes or no. The default is no. For V.25 *bis* link circuits you should set this option to yes.

Example:

```
set send_line_id
Send Line ID? (Yes, No): [No]
```

Exit C M

Return to the previous prompt.

Syntax: exit

Example:

```
exit
```

8.8 PPP 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 list describes the output from the **interface** command:

Nt	Indicates the serial line interface number.
Nt'	Indicates the base network interface number if this is a Dial Circuit.
Interface	Indicates the interface type and its instance number.

CSR	Indicates the command and status register addresses of base network.
Vec	Indicates the interrupt vector address.
Self-Test Passed	Indicates the number of self-tests that succeeded.
Self-Test Failed	Indicates the number of self-tests that failed.
Maintenance Failed	Indicates the number of maintenance failures.
Adapter cable	Indicates the type of adapter cable that the level converter is using.
V.24 circuit	Indicates the circuit numbers as identified by V.24 specifications.
Nicknames	Indicates the common names for the circuits.
PUB 41450	Indicates the PUB 41450 names for the circuits.
State	Indicates the current state of the circuits (ON or OFF).
Line speed	Indicates the transmit clock speed (approximate).
Last port reset	Indicates the length of time since the port was reset.
Input frame errors:	
CRC error	Indicates the number of packets received that contained checksum errors and as a result were discarded.
alignment (byte length)	Indicates the number of packets received that were not an even multiple of 8 bits in length and as a result were discarded.
too short (<2 bytes)	Indicates the number of packets received that were less than 2 bytes in length and as a result were discarded.
too long (>2180 bytes)	Indicates the number of packets received that were greater than the configured frame size and as a result were discarded.
aborted frame	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.

9

Configuring and Monitoring Serial Line Network Interfaces

This chapter describes the commands that configure serial interfaces. Since there is *no* console process for serial interfaces, the chapter also describes how to use GWCON to monitor the interface.

9.1 Accessing the Interface Configuration Process

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

9.2 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.

9.3 Serial Line Configuration Commands

This section explains the serial line configuration commands. Enter these commands at the `SLC Config>` prompt.

Table 9–1 lists the serial configuration commands.

9.3 Serial Line Configuration Commands

Table 9–1 Serial Configuration Command Summary

Command	Function
? (Help)	Displays all the serial commands or lists subcommand options for specific commands.
Disable	Disables pseudo-serial-ethernet.
Enable	Enables pseudo-serial-ethernet.
List	Displays the current serial interface configuration.
Set	Sets the clock rate, encoding scheme, frame-size, datalink idle state, pseudo-serial-ethernet MAC address and IPX encapsulation, line speed, and the time that elapses between the transmission of each frame.
Exit	Exits the serial config process.

? (Help) C

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
SET
EXIT
```

Example:

```
set ?
ENCODING
FRAME-SIZE
IDLE
PSEUDO-SERIAL-ETHERNET
TRANSMIT-DELAY
```

Disable C

Disable pseudo-serial-ethernet.

Syntax: disable pseudo-serial-ethernet

Example:

```
disable pseudo-serial-ethernet
```

Enable C

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 pseudo-serial-ethernet
```

List C

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 last two lines (displaying the Ethernet MAC address and IPX encapsulation) appear only when pseudo-serial-ethernet is enabled.

Maximum network layer frame size — The maximum size of the frames transmitted on the datalink, as specified by the **set frame-size** command.

Transmit delay counter — The minimum time that elapses between the transmission of each frame.

9.3 Serial Line Configuration Commands

HDLC Data Encoding	The transmission encoding scheme for the serial interface. Scheme is NRZ (non-return to zero) or NRZI (non-return to zero inverted).
HDLC Idle State	The datalink idle state: flag or mark.
Speed	The rate generated on the transmit and/or receive lines.
Pseudo Serial Ethernet	Indicates whether pseudo-serial-ethernet is enabled or disabled. If it is enabled, the next two lines appear as output.
Ethernet MAC address	A 12-digit hexadecimal value.
Ethernet IPX encapsulation	The configured IPX encapsulation.

Set C

Configure the encoding scheme, frame-size, datalink 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 . . .
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
```

9.3 Serial Line Configuration Commands

frame-size ***#***

Sets the size of the network layer portion of frames transmitted and received on the datalink. Datalink 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 ***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-address 203456345567
```

pseudo frame ***encapsulation-type***

Specifies the Ethernet IPX encapsulation. The choices include:

Ethernet_8022	Packet format includes an 802.2 header. This is the default for NetWare versions 4.0 and later.
Ethernet_8023	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.
Ethernet_II	Uses Ethernet type 8137 as the packet format. This format is required if you are using NetWare IPX on the Ethernet.
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.

Example:

```
set pseudo frame Ethernet_8022
```

9.3 Serial Line Configuration Commands

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 9-2 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 9–2 Transmit Delay Values

Model Number	Transmit-Delay Value
RouteAbout Access EW	6
RouteAbout Access TW	40

Exit

Return to the previous prompt level.

Syntax: exit

Example:

```
exit
```

9.4 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 (+). Refer to Chapter 1 for more information about entering the GWCON process.

9.4.1 Serial Interface Line Interface Example

The following example shows the output from the **interface** command for the serial interface.

```
                                    Self-Test  Self-Test   Maintenance
Nt Nt’  Interface      CSR    Vec     Passed     Failed        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

DDLC Bus/Addr Faults               0          T1/E1 Intf ROM Rev     1.7
DDLC Rcv Overruns                  0
```

The next section describes the output from the **interface** command:

Self-Test: Passed Number of self-tests that succeeded.

Nt Global network number.

Nt’ Number for Nt’ is identical to the number for Nt.

Interface Interface name and its port number.

CSR Command and status register addresses.

9.4 Statistics for the Serial Interfaces

Vec	Interrupt vector address.
Self-Test: Failed	Number of self-tests that failed.
Maintenance: Failed	Number of maintenance failures.
Line speed	Calculated.
Last port reset	The days, hours, minutes, and seconds since the last port reset.
Interface type	Physical type of the interface.
Active signals (DCD/CTS/ DSR)	Active signals on the interface: Data Carrier Detect (DCD), Clear-to-Send (CTS), and Data Set Ready (DSR).
Total transmits	Number of packets transmitted over the interface.
Tx abort requested	Number of local requests for aborting a packet transmission.
Tx FIFO Underruns	Number of times that data was not provided for transmission because the processor and transmitter were not in sync. The packets are discarded.
Rcv CRC/Frame errors	Number of checksum and frame errors received on all incoming packets. The packets are discarded.
Rcv Buffer Overruns	Number of times that a packet was to long to fit into the buffer. The packets are discarded.
DDLC Bus/Addr faults	Number of times the DDLC (Dual Data Link Controller) attempted an illegal access. These faults indicate a hardware problem.
DDLC Rcv Overruns	Number of times the DDLC chip ran out of internal buffers.
Total receives	Number packets received over the interface.
Tx abort (no CTS)	Number of transmits that were aborted because a clear-to-send signal was not received.
Rcv FIFO Overruns	Number of times that the local system bus was unavailable to transfer packets. The packet is then discarded.

Rcv packets dropped Number of receive (Rcv) packets that were dropped.

T1/E1 Intf ROM Rev PROM revision level of the serial interface.

9.4.2 RouteAbout Access EW Serial Line Interfaces

The following example shows output for the RouteAbout Access EW serial interface:

```
+ interface
                                                  Self-Test  Self-Test   Maintenance
Nt  Nt'   Interface      CSR  Vec      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
                                               Self-Test  Self-Test  Maintenance
Nt Nt' Interface       CSR  Vec     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' Base network on which this circuit is configured.

9.4 Statistics for the Serial Interfaces

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.
V.24 circuit Nicknames Pin Assignments State	Circuits, control signals, pin assignments and their state (ON or OFF). describes the output for each adapter cable type. **Note:** The symbol - - - in console output indicates that the value or state is unknown.
Line speed	Transmit clock rate.
Last port reset	Length of time since the last port reset.
Input frame errors	
CRC error	Number of packets received that contained checksum errors and as a result were discarded.
alignment (byte length)	Number of packets received that were not an even multiple of 8 bits in length and a result were discarded.
missed frame	Number of packets that were less than 2 bytes in length and as a result were discarded.
too long (> 2052 bytes)	Number of packets that were greater than the configured size, and as a result were discarded.
aborted frame	Number of packets received that were aborted by the sender or a line error.
DMA/FIFO overrun	Number of times the serial interface could not send data fast enough to the system packet buffer memory to receive them from the network.
L & F bits not set	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 9–3 lists the V.24 circuits, nicknames, nickname descriptions, cable types and cable circuit function descriptions.

Table 9–3 V.24 Circuits and States

Cable Type: RS-232 DTE				
V.24Circuit	**Nickname**	**Description**	**RS-232**	**Description**
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 9–3 V.24 Circuits and States (Continued)

Cable Type: RS-422 DTE				
V.24 Circuit	**Nickname**	**Description**	**EIA 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 Ready	TR	Terminal Ready
109	DCD	Data Channel Received Line Signal Detector	RR	Receiver Ready
111			SR	Signaling Rate Selector
116			SS	Select Standby
125	RI	Ring Indicator	IC	Incoming Call

Cable Type: V.35 DTE				
V.24 Circuit	**Nickname**	**Description**	**PUB 41450**	**Description**
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
125 141	RI	Ring Indicator	CE	Ring Indicator

Table 9–3 V.24 Circuits and States (Continued)

Cable Type: X.21 DTE	
Field	**Description**
Control:	Control from DTE to DCE.
Indication:	Indication from DCE to DTE.

Cable Type: 75 Ohm Coax				
V.24 Circuit	**Nickname**	**Description**	**PUB 41450**	**Description**
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		

Cable Type: 120 Ohm Pair				
V.24 Circuit	**Nickname**	**Description**	**PUB 41450**	**Description**
109	DCD	Data Channel Received	CF	Received Line Signal Detector
140	L-Loop	Line Signal Detector Local loopback	CE	Ring Indicator
N/A	R-Loop	Provide remote Loopback		

Cable Type: Undefined
The software has not yet detected the cable type, or no cable is connected.

10

Configuring and Monitoring IEEE 802.5 Token Ring Network Interfaces

This chapter describes how to configure and monitor Token Ring interfaces in the router.

10.1 Accessing the Interface Configuration Process

For information about accessing the configuration and console processes, 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.

Enter configuration commands at the `TKR config>` prompt.

Enter console (monitoring) commands at the `TKR>` prompt.

10.2 Token Ring Configuration and Console Commands

This section explains the Token Ring configuration and console commands. The sections that follow explain these commands.

Table 10–1 summarizes the Token Ring configuration and console commands.

10.2 Token Ring Configuration and Console Commands

Table 10–1 Token Ring Configuration and Console Command Summary

Command	Task	Function
? (Help)	Configure/Monitor	Displays all the Token Ring commands or lists subcommand options for specific commands.
Connector-location	Configure	Displays all the Token Ring commands or lists subcommand options for specific commands.
Dump	Monitor	Displays a dump of the RIF cache.
Frame	Configure	Sets the NetWare IPX encapsulation type.
List	Configure	Displays the selected Token Ring interface configuration.
LLC	Configure/Monitor	Accesses the LLC configuration or monitoring process and displays the LLC> prompt.
Media	Configure	Sets the media-type as shielded or unshielded.
Packet-Size	Configure	Changes packet-size defaults for this Token Ring network.
Set	Configure	Sets the aging timer for the RIF cache and the MAC address.
Source-routing	Configure	Enables or disables source-routing on the interface.
Speed	Configure	Sets the interface speed in Mbps.
Srt-stat	Monitor	Displays statistical information for transparent bridging.
Exit	Configure/Monitor	Exits the config and monitor processes and returns to the previous prompt level.

? (Help) C M

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: ?

10.2 Token Ring Configuration and Console Commands

Example:

```
TKR Config>?
CONNECTOR-LOCATION
FRAME
LIST
LLC
MEDIA
PACKET-SIZE
SET
SOURCE-ROUTING
SPEED
EXIT
```

Example:

```
TKR>?
DUMP
LLC
SRC-STAT
EXIT
```

Connector-Location C

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
```

10.2 Token Ring Configuration and Console Commands

Dump M

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
```

MAC address Displays the MAC address of the Token Ring interface.

State Displays one of the five interface states:

- **On_ring** indicates that a RIF was found for a node on the ring.
- **Have_route** indicates that a RIF was found for a node on a remote ring.
- **No_route** is displayed for a brief period of time as an explorer frame is sent out and the router is waiting for a return.
- **Discovering** indicates that the router sent an explorer frame to rediscover the RIF.
- **St_route** indicates a route obtained from a Spanning tree explorer.

Usage Indicates that a RIF was used in a packet. The number is arbitrary and has no functional significance.

RIF Displays a code that indicates the Routing Information Field in hexadecimal notation.

10.2 Token Ring Configuration and Console Commands

Frame C

Set the NetWare IPX encapsulation type. Table 10–2 lists the encapsulation types you can use.

Table 10–2 Frame Command NetWare IPX Encapsulation Types

Option	Description	Syntax
Token Ring using MSB	Uses the standard 802.2 IPX header with the non-canonical Token Ring address bit ordering (MSB).	frame token_ring msb
Token Ring using LSB	Uses the 802.2 IPX header with the canonical address bit ordering (LSB).	frame token_ring lsb
Token Ring with 802.2 SNAP using MSB	Uses the 802.2 format with a SNAP header and non-canonical address bit ordering. This encapsulation is used primarily in bridging environments.	frame token_ring_snap msb
Token Ring with 802.2 SNAP using LSB	Uses the 802.2 format with a SNAP header and canonical address bit ordering.	frame token_ring_snap lsb

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.

10.2 Token Ring Configuration and Console Commands

List C

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
```

Packet size	Indicates the size of the Token Ring packet.
Speed	Indicates the speed of the network in megabits per second.
Media	Indicates the type of media the network uses: shielded or unshielded. May display **auto-config** as a media setting. This indicates that media type is selected automatically.
Connector Location	Indicates whether connector used the front panel (front) or back plane (back)
RIF Aging Timer	Indicates the amount of time that the router holds the information contained in the Routing Information Field (RIF).
Source Routing	Indicates the status of the source-routing feature: enabled or disabled.
MAC Address	Indicates the configured MAC address that was set with the **set physical-address** command. If all zeros are displayed, the MAC address is the default address.

10.2 Token Ring Configuration and Console Commands

LLC **C M**

Access the LLC prompt. LLC commands are entered at this new prompt. See Chapter 7 for an explanation of each of these commands.

Syntax: llc

Example:

```
TKR_Config>llc
LLC user configuration
LLC Config>
```

Example:

```
TKR>llc
LLC user monitoring
LLC>
```

Media **C**

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 **C**

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
```

10.2 Token Ring Configuration and Console Commands

Set C

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 C

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: so urce-routing
enable
disable

Example:
```
source-routing enable
```

Speed C

Change data speed. The default speed is 4 Mbps. Enter the **speed** command followed by the *speed-value* (in megabits per second).

Syntax: speed *speed-value*

Example:
```
speed 16
```

SRT-STAT M

Use the **srt-stat** command to display information specific to transparent bridging configured on this interface.

Syntax: srt-stat

Example:
```
srt-stat
```

Exit C M

Use the **exit** command to return to the previous prompt level.

Syntax: exit

Example:
```
exit
```

10.3 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.

10.3.1 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:

```
+ interface 2
                                    Self Test     Maint      Errors
Nt  Nt'  Intrfc No     CSR   Vec    Pass   Fail    Fail   Input Output
2   2    TKR     0   80002000  4C      1      0       0       0     0


Token-Ring /802.5  MAC/data-link on DEC Token-Ring 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:

Nt Global interface number

Intrfc Interface name

No Number of this interface within interfaces of type “*intrfc*”

CSR COMM and Status Registers address

Vec	Interrupt vector
SlfTst: Pass	Number of times self-test succeeded
SlfTst: Fail	Number of times self-test failed
Maint: Fail	Number of maintenance failures
Errs: Input	Number of input errors
Errs: Output	Number of output errors

The following section describes the statistics displayed that are specific to the Token Ring interfaces:

Physical address	Specifies the physical address of the Token Ring interface.
Network speed	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.
Max packet size (info)	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.
Handler state	Displays the current state of the Token Ring handler. The Handler state counter displays the state of the handler after the self-test runs.
# of times signal lost	Specifies the total number of times that the router was unable to transmit a packet due to loss of signal.
Hard errors	Displays the number of times the interface transmits or receives beacon frames from the network.
Auto-removal errors	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.
Ring recovery actions	Displays the number of times the interface detects claim token medium access control (MAC) frames on the network.

10.3 Token Ring Interfaces and the GWCON Interface Command

Line errors

The Line Errors counter increments when a frame is repeated or copied and the Error Detected Indicator (EDI) is zero for the incoming frame.

One of the following conditions must also exist:

- A token with a code violation exists.
- A frame has a code violation between the starting and ending delimiter.
- A Frame Check Sequence (FCS) error occurs.

ARI/FCI errors

The ARI/FCI (Address Recognized Indicator/Frame Copied Indicator) Errors counter increments if the interface receives either of the following:

- 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.
- More than one SMP MAC frame with the ARI/FCI bits equal to zero, without an intervening AMP MAC frame.

This error indicates that the upstream neighbor copied the frame but is unable to set the ARI/FCI bits.

Frame copy errors

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.

Lost frames

Displays the number of times the interface is in transmit mode (stripping) and fails to receive the end of a transmitted frame.

 # times beaconing

Displays the number of times the interface transmits a beacon frame to the network.

Lobe wire faults

Displays the number of times the network detects an open or short circuit in the cable between the interface and the wiring concentrator.

Removes received

Displays the number of times the interface receives a remove ring station MAC frame request and removes itself from the network.

10.3 Token Ring Interfaces and the GWCON Interface Command

Burst errors	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.
Inputs dropped	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.
Token errors	The token errors counter increments when the active monitor detects a token protocol with any of the following errors: • The MONITOR_COUNT bit of token with non-zero priority equals one. • The MONITOR_COUNT bit of a frame equals one. No token or frame is received within a 10 millisecond window. • The starting delimiter/token sequence has a code violation in an area where code violations must not exist.

11

Configuring and Monitoring V.25 *bis* Network Interfaces

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 and monitor a V.25 *bis* interface.

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

11.1 Accessing the Interface Configuration and Console Processes

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

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.

Enter configuration commands at the `V25bis config>` prompt.

Enter monitoring (console) commands at the `V25bis>` prompt.

Refer to Chapter 2 for details about configuring and monitoring Dial Circuits on V.25 *bis* network interfaces.

11.2 Configuration Procedures

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

1. Set up a serial line interface.
2. Either add a network address name and network address, or configure the modem to dial the remote station.

11.2 Configuration Procedures

3. Add Dial Circuits.
4. Configure Dial Circuit parameters.
5. Configure 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.

11.2.1 Configuring the Modem for DTR Dialing

If you are using a modem which does not support V.25 *bis* auto-calling on a V.25 *bis* circuit, you will need to use the DTR dialing procedure. This procedure uses the modem's direct call operating mode. You must manually configure the local modem with the dial address of the remote destination. Use a terminal to access the modem and enter the configuration commands to store the remote dial address in the modem's default dialing register. Refer to your modem's documentation for more information about manually configuring the modem.

11.2.2 Adding a Network Address Name and Network Address

If you are using DTR dialing you do not need perform this step, otherwise 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
```

11.2.3 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 datalink types (Frame Relay, X.25, V.25 *bis*, SDLC, and SRLY) are not supported at this time.

11.2.4 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 Chapter 2 to configure the Dial Circuit.

11.3 V.25 *bis* Configuration and Console Commands

This section explains the V.25 *bis* configuration and console (monitoring) 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. Enter the V.25 *bis* console commands at the `V.25bis>` prompt.

11.3 V.25 bis Configuration and Console Commands

Table 11–1 summarizes the V.25 *bis* configuration and console commands.

Table 11–1 V.25 *bis* Configuration and Console Command Summary

Command	Task	Function
? (Help)	Configure/Monitor	Lists the configuration and console commands, or lists the options associated with that command.
Calls	Monitor	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.
Circuits	Monitor	Shows the status of all data circuits configured on the V.25 *bis* interface.
Parameters	Monitor	Displays the current parameters for the V.25 *bis* interface. (This command is similar to the `V.25bis Config>` **`list`** command.)
Satistics	Monitor	Displays the current statistics for the V.25 *bis* interface.
List	Configure	Displays the V.25 *bis* configuration.
Set	Configure	Sets the local address, dial mode, connect, disconnect, and no answer timeouts, number of retries after no answer, and command delay timeout.
Exit	Configure/Monitor	Exits the V.25 *bis* configuration or console process and returns to the previous prompt level.

? (Help) C M

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
```

Calls M

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.

11.3 V.25 bis Configuration and Console Commands

Circuits M

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.

MAC/Data-Link Type of datalink protocol configured for this Dial Circuit.

State Current state of the Dial Circuit:

- **Up** – Currently connected
- **Available** – Not currently connected, but available
- **Call** – Call in the process of being set up
- **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.
- **Remote Disconnect** – The circuit is either Down or Available because the remote destination disconnected the call.
- **Operator Request** – The circuit is Available because the last call was disconnected by a console command.
- **Inbound** – The circuit is Up because the circuit answered an inbound call.
- **Restoral** – The circuit is Up because of a WAN-Restoral operation.

Reason (continued)

- **CB Rsp –** an incoming call was cleared because call-back was enabled (accepter).
- **Bad ID –** During call setup either the local or remote modem signals did not come up.
- **Encp Fld** – PPP self test failed.
- **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 M

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.25bis 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
```

Local Network Address Name: Network address name of the local port.

Local Network Address: Network dial address of the local port.

11.3 V.25 bis Configuration and Console Commands

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 to an address.

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.

Statistics M

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
```

Level converter: Type of level converter connected to the V.25 *bis* interface.

Adapter cable: Type of adapter cable that the level converter is using.

V.24 circuit: Circuit numbers as identified by V.24 specifications.

Nicknames: Common names for the circuits.

PUB 41450: PUB 41450 names for the circuits.

State: Current state of the circuits (ON, OFF, or "---," which means that the state is undefined for this type of interface.

Line speed: The transmit clock speed (approximate).

Last port reset: Length of time since the port was reset.

Input frame errors:

- *CRC error* Number of packets received that contained checksum errors and were discarded.
- *Alignment (byte length)* Number of packets received that were not an even multiple of 8 bits in length and were discarded.
- *too short (<2 bytes)* Number of packets received that were less than 2 bytes in length and were discarded.
- *too long (>nnnn bytes)* Number of packets received that were greater than the configured frame size (*nnnn*) and were discarded.
- *aborted frame* Number of packets received that were aborted by the sender or a line error.

11.3 V.25 bis Configuration and Console Commands

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.

List C

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

Dial Mode           = V25BIS-DIAL
```

Local Network Address Name:	Displays the network address name of the local port. This value is not displayed if the dialing mode is DTR-DIAL.
Local Network Address:	Displays the network dial address of the local port.This value is not displayed if the dialing mode is DTR-DIAL.

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.

Dial Mode The dialing mode used for this circuit. The mode is either V25BIS-DIAL (default) or DTR-DIAL.

Set C

Configure local addresses, dial mode, timeouts and delays for calls, and retries and timeouts for non-responding addresses.

Syntax: set

command-delay-timeout . . .
connect-timeout . . .
dial-mode . . .
disconnect-timeout . . .
local-address . . .
retries-no-answer . . .
timeout-no-answer . . .

11.3 V.25 bis Configuration and Console Commands

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
```

dial-mode ***mode***

Specifies the dialing mode to use. Valid values for modes are **V25BIS-DIAL** (default) or **DTR-DIAL**. Use DTR-DIAL if your modem does not support V.25 *bis* automatic dialing.

Example:

```
set dial-mode dtr-dial
```

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 **C M**

Return to the `Config>` prompt.

Syntax: exit

Example:

```
exit
```

12

Configuring and Monitoring X.25 and X.25-LLC2 Network Interfaces

This chapter describes the X.25 configuration and console commands for both the X.25 network interface and the X.25-LLC2 pseudo interface.

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.

The X.25-LLC2 pseudo interface connects a router to an LLC DTE over a local area network. The X.25-LLC2 pseudo interface software allows the router to communicate using X.25 protocol over a LAN by using the LLC2 protocol for message transfer.

12.1 Accessing the Interface Configuration and Console Processes

Follow the procedure described in Chapter 1 to access the configuration and console processes for the interfaces 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.

Enter configuration commands at the configuration process prompt for X.25 interfaces (`X.25 Config>`) or for X.25 LLC2 pseudo interfaces (`X.25-LLC2 Config>`).

Enter console (monitoring) commands at the `X.25>` or `X.25-LLC2>` prompt.

Note: The X.25-LLC2 pseudo interface does not use the X.25 level 2 (frame level) protocol, and it does not support data compression or permanent virtual circuits. Commands which relate to these features do not apply to the X.25-LLC2 interface and are clearly indicated in this chapter.

12.2 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 datalink to X.25**. If you are using a synchronous line to connect to a remote DTE across a WAN interface you must set the datalink to X.25 by entering the **set data-link x25** command at the `Config>` prompt.

Example:

```
Config> set data-link x25 2
```

or

- **Adding an X.25-LLC2 pseudo device.** If you are connecting to a remote DTE over a local area network you must add an X.25-LLC2 pseudo device and associate it with the LAN interface and the MAC address of the remote DTE. Use the **add device X25-LLC2** command at the `Config>` prompt.

  For example, to configure an X.25LLC2 device which connects to a DTE at MAC address 08002BB19F1D using the device Eth/0 use this command:

Example:

```
Config> add device x25-llc2
LAN ifc [0]?
Remote MAC address []? 08002BB19F1D
Adding device as interface 3
Use ”net 3” command to configure parameters
```

Note: Refer to the *System Software Guide* for more details about the **set data-link** and **add device** commands. For more information about configuring an Ethernet interface, refer to Chapter 3.

- **Setting the local X.25 address**. After setting the datalink, 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 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. You must define the range of PVCs starting from 1 to *n*.
2. SVCs may follow the defined PVCs. If SVCs follow PVCs, they *must not* overlap.
3. The total number of SVC channel numbers and PVC channel numbers cannot exceed 239.
4. 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 over an X.25 network interface, 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* overlap the SVC ranges. You must also define the PVCs individually using the **add pvc** command.

Note: X.25-LLC2 pseudo devices and X.25 Dial Circuits *do not* support the use of PVCs.

- **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 need to add the protocols only 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.

12.2.1 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.

12.2.2 Setting the X.25 Node Address

Specify an X.25 node address for each interface by entering the X.25 configuration **set address** command.

12.2.3 Configuring Data Compression on X.25 Network Interfaces

Data compression is available on X.25 network interfaces, but is *not* available for use over the LAN by X.25-LLC2 pseudo devices. Refer to the *Routing Protocols Reference Guide* for details about how data compression operates over switched virtual circuits.

You can use the Stac LZS data compression algorithm to compress the data before it is packetized for transmission over SVCs or OSI/DNA V DA or DLM circuits. Each type of router has a maximum number of compression dictionaries allowed. You must enable compression on each X.25 interface, using the **enable compression** command. This command lets you configure the number of dictionaries allocated per interface, up to the maximum number allowed for the router.

One dictionary is allocated to each call on the interface to record the data history for the call and compression is calculated based on the recorded history. If there are no more dictionaries available when a new call is made, compression for that call is on a per-message basis.

For X.25 supported protocols other than DNA V/OSI, you configure compression for an outgoing call to a particular destination when using the **add address** command. A prompt asks if compression is to be negotiated for calls to the specified destination address.

Note: Compression on OSI/DNA V DA and DLM circuits is configured from the OSI console when using the **add template** command. Refer to the *Routing Protocols Users Guide* for details about configuring OSI/DNA V circuits.

For calls *without* a dictionary, the overhead of compressing and decompressing small data messages may be excessive, so routing packets below the minimum threshold are not compressed. You can modify the threshold for the smallest message to compress using the **set minimum-compression-message-size** command. Since compression occurs before packetization this size represents the minimum-sized routing packet which will be compressed.

Note: The minimum-compression-message-size value only affects calls using compression WITHOUT a dictionary. Calls using a dictionary will compress all packets.

If the data being transmitted is already in a compressed format (for example, JPEG format image data), then the compression algorithm may cause the data to expand. If there is a long sequence of data which cannot be compressed, then compression is suspended dynamically. By default, compression is disabled after a sequence of 5000 bytes of data which cannot be compressed. You can change this threshold using the **set compression-disable-threshold** command. Data is then transmitted uncompressed; however the compressor continues to attempt to compress data in order to detect whether the data is no longer expanding. When expansion has stopped, compression resumes.

12.2.4 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.

12.3 Configuring X.25 Dial Circuits over ISDN

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.

12.3 Configuring X.25 Dial Circuits over ISDN

You can configure X.25 SVCs on an X.25 Dial Circuit over an ISDN network interface. X.25 PVCs are not supported on X.25 Dial Circuits. Commands and listings related to PVCs are suppressed when configuring or monitoring X.25 Dial Circuits.

See Chapter 2 for details about configuring Dial Circuits, and using X.25 Dial Circuits over an ISDN network interface.

12.4 X.25 Configuration and Console Commands

This section summarizes and explains all the configuration and console commands for X.25 network interfaces and X.25-LLC2 pseudo devices.

Table 12–1 lists the commands, which allow you to specify and monitor 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, or at the `X.25-LLC2 Config>` prompt.

Enter console (monitoring) commands at the `X25>` prompt.

Table 12–1 X.25 Configuration and Console Commands Summary

Command	Task	Function
? (Help)	Configure/ Monitor	Lists the interface commands or lists the options associated with specific commands.
Add	Configure	Adds an address translation, a protocol encapsulation, or a PVC definition.
Change	Configure	Changes an address translation, a protocol encapsulation, or a PVC definition.
Delete	Configure	Removes an address translation, a protocol encapsulation, or a PVC definition.

Table 12–1 X.25 Configuration and Console Commands Summary (Continued)

Command	Task	Function
Disable	Configure	Disables interface-resets, incoming-calls-barred, outgoing-calls-barred feature, data compression or dynamic DDN address translations.
Enable	Configure	Enables interface-resets, incoming-calls-barred, outgoing-calls-barred features, data compression or dynamic DDN address translations.
List	Configure/ Monitor	Lists the defined address translations, National Personality Parameters, protocol encapsulation, data compression or PVC definitions. From the console level, lists individual PVC or SVC statistics and general information.
National Disable	Configure	Disables features defined by the National Personality configuration.
National Enable	Configure	Enables features defined by the National Personality configuration.
National Restore	Configure	Restores the National Personality configuration to its default values.
National Set	Configure	Sets parameters defined by the National Personality configuration.
Parameters	Monitor	Displays the current parameters for any level of the X.25 configuration.
Set	Configure	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. Defines data compression thresholds and line speed.
Statistics	Monitor	Displays the current statistics for any level of the X.25 configuration.
Exit	Configure/ Monitor	Exits the X.25 configuration and monitor processes and returns to the previous prompt level.

12.4 X.25 Configuration and Console Commands

? (Help) C M

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 C

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.

Note: If you use this command to add a translation for an IP address in the same subnet as the local system then you do not need to add a static route. It is not necessary to do an **add route** for subnets that are directly connected to the calling router.

Example:

add address

IP Example:

```
Protocol [IP]? IP
IP Address [0.0.0.0]?
X.25 Address []?
Compression? [DISABLED]?
```

IPX Example:

```
Protocol [IP]? IPX
CUD Field Usage (Proprietary or Standard) [Standard]?
IPX Host Number (in hex) []?
X.25 Address []?
Compression? [DISABLED]?
```

DN Example:

```
Protocol [IP]? DN
Decnet Address [0.0]?
X.25 Address []?
Compression? [DISABLED]? enabled
```

Protocol	Specifies the protocol type of the address mapping you are adding: IP, IPX, or DN. The default is IP.
IP Address	Specifies the destination's IP address.
IPX Host Number	Specifies the IPX host number of the destination.

CUD Field Usage	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 message appears:
	`Invalid CUD usage type`
	`Standard default will be used`

Decnet Address	Specifies the area and node of the DECnet address that you want to add.
X.25 Address	Specifies the PDN interface's X.25 address that connects to the router. The maximum address length is 15 digits.

12.4 X.25 Configuration and Console Commands

Compression	Specifies whether compression will be negotiated when making an outgoing call to this destination. The default is disabled. **Note:** Compression is not available on X.25-LLC2 pseudo interfaces.

htf-address

Adds a DDN (Defense Data Network) X.25 address translation.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
add htf-address
Protocol [IP]
Current HTF address
```

Protocol	Specifies the protocol that you are running over the X.25 interface. DDN supports IP only.
Current HTF address	Specifies the destination PDN address in Host Table Format (HTF) format. Also refer to ddn-address-translations 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]
```

Protocol	Specifies which protocol's encapsulation parameters you want to add: IP, IPX, or DN. The default is IP.

Window Size	Specifies the number of packets that can be outstanding before an adjacent circuit is established to the same destination. The default is 2.
Default Packet Size	Specifies the default requested packet size for SVCs. This value must be equal to or less than the maximum packet size specified with the **national set packet-size** command. The default value is 128 bytes.
Maximum Packet Size	Specifies the maximum negotiated packet size for SVCs. This value must be equal to or less than the maximum packet size specified with the **national set packet-size** command. The default is 256.
Circuit Idle Time	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.
Maximum SVCs	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 4.

pvc

Adds a PVC definition. The prompts that appear depend on the protocol that you are adding to the PVC.

Note: This command applies only to X.25 network interfaces. It is not available on X.25-LLC2 pseudo interfaces or X.25 Dial Circuits.

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]?
```

Protocol	Specifies which protocol's encapsulation parameters you want to modify: IP or IPX. The default is IP.
Packet Channel	Specifies the circuit number of the PVC.
Destination X.25 Address	Specifies the address of the PVCs destination.
Window Size	Specifies the number of packets that can be transmitted before an acknowledgment is needed. If this number of packets are transmitted no further packets can be sent until an acknowledgement is received. The default is 2.
Packet Size	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 **national set packet-size** command.

Change C

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 you are changing.

Example:

`change address`

IP Example:

```
Protocol [IP]? IP
IP Address [0.0.0.0]?
X.25 Address [00000124040000]?
Compression [DISABLED]?
```

IPX Example:

```
Protocol [IP]? IPX
CUD Field Usage (Proprietary or Standard) [Standard]?
IPX Host number (in hex) []?
X.25 Address [00000124040000]?
Compression [DISABLED]?
```

DN Example:

```
Protocol [IP]? DN
Decnet Address [0.0]?
X.25 Address [00000124040000]?
Compression [ENABLED]?
```

Protocol — Specifies the protocol type of the address mapping you want to change: IP, IPX, or DN. The default is IP.

IP address — Specifies the destination protocol interface's IP address.

CUD Field Usage — 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 message appears:

```
Invalid CUD usage type
Standard default will be used
```

X.25 address — Specifies the destination's new PDN X.25 address. The default is current PDN X.25 address.

Decnet Address — Specifies the area and node of the DECnet address that you want to change.

IPX Host number — Specifies the IPX host number that you want to change. The default is current host number.

12.4 X.25 Configuration and Console Commands

Compression	Specifies whether compression will be negotiated when making an outgoing call to this destination. The default is the current setting. **Note:** This parameter applies only to X.25 network interfaces. Compression is not available on X.25-LLC2 pseudo interfaces.

htf-address

Changes a DDN X.25 address translation.

Note: This command applies only to X.25 network interfaces. It is not available on X.25-LLC2 pseudo interfaces.

Example:

```
change htf-address
Protocol [IP]
Change HTF address [0.0.0.0]?
New HTF address [10.4.0.124]?
```

Protocol	Specifies the protocol that you are running over the X.25 interface. DDN supports IP only.
Change HTF address	You must specify the current Host Table Format (HTF) address that you want to change.
New HTF address	Specify the new HTF address. The default is current HTF 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]
```

Protocol	Specifies which protocol's encapsulation parameters you want to change: IP, IPX, or DN. The default is IP.
Window Size	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.
Default Packet Size	Specifies the default requested packet size for SVCs. This value must be equal to or less than the maximum packet size specified with the **national set packet-size** command. The default is the previous value.
Maximum Packet Size	Specifies the maximum negotiated packet size for SVCs. This value must be equal to or less than the maximum packet size specified with the **national set packet-size** command. The default is the previous value.
Circuit Idle Time	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.
Maximum SVCs	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.

12.4 X.25 Configuration and Console Commands

pvc

Changes a PVC definition. The prompts that appear, depend on the protocol's PVC that you are changing.

Note: This command is not available on X.25-LLC2 pseudo interfaces or X.25 Dial Circuits since they do not support the use of PVCs.

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]?
```

Protocol	Specifies which protocol's encapsulation parameters you want to change: IP or IPX. The default is IP.
Packet Channel	Specifies the circuit number of the PVC. The default is currently defined circuit number.
Destination X.25 Address	Specifies the address of the PVCs destination. The default is the currently defined X.25 address.
Window Size	Specifies the maximum number of packets that can be transmitted before an acknowledgment is received. The default is the currently defined window size.
Packet Size	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 **national set packet-size** command. The default is the currently defined packet size.

Delete C

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]?
```

Protocol	Specifies the protocol type of the address mapping you are deleting. The default is IP.
IP Address	Specifies the destination protocol interface's IP address.
IPX Host Number	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
```

12.4 X.25 Configuration and Console Commands

pvc

Deletes a PVC definition.

Note: This command is not available on X.25-LLC2 pseudo interfaces or X.25 Dial Circuits since they do not support PVCs.

Example:

```
delete pvc
Protocol [IP]?
Destination X.25 Address []?
```

Protocol	Specifies the protocol that you are running over the X.25 interface. DDN supports IP only.
Destination X.25 Address	Specifies the address of the PVCs destination.

Disable C

Disable DDN address translations, interface resets as part of network certification, or the incoming-calls-barred or the outgoing-calls-barred features.

Syntax: disable

compression
ddn-address-translations
interface-resets
incoming-calls-barred
outgoing-calls-barred

compression

Disables data compression on this X.25 interface.

Note: Data compression is not available on X.25-LLC2 pseudo interfaces.

Example:

```
disable compression
```

ddn-address-translations

Specifies that the DDN host table format (IP) addresses are not dynamically converted to X.121 call addresses.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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 C

Enable data compression, DDN address translations, interface resets, or to enable the incoming-calls-barred or the outgoing-calls-barred features.

Syntax: enable

compression
ddn-address-translations
interface-resets
incoming-calls-barred
outgoing-calls-barred

12.4 X.25 Configuration and Console Commands

compression

Enables data compression and specifies the number of data dictionaries which will be allocated to this interface. The default is Disabled.

Note: Data compression is not available on X.25-LLC2 pseudo interfaces.

Example:

```
enable compression
Maximum number of compression dictionaries [5]?
Compression enabled with 5 dictionaries
```

Maximum number of compression dictionaries	Specifies the maximum number of data dictionaries which will be permitted on this interface. The total number of data dictionaries allocated cannot exceed the maximum for this router. The default is 5 dictionaries.

ddn-address-translations

Specifies that the DDN host table format (IP) addresses are dynamically converted to X.121 call addresses. The default is Disabled.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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 C

Display the current configuration for the specified parameter.

Syntax: list
- addresses
- all
- detailed
- protocols
- pvcs
- summary

addresses

Lists all the X.25 address translations.

Example:

```
list addresses
X.25 address translation configuration

IF#    Prot #  Compression  Protocol -> X.25 address
1       0      Enabled      10.1.2.1 -> 1238765742
1       4      Enabled      1.10     -> 9910
1       7      Disabled     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 for.

Compression Displays whether compression negotiation has been enabled for outgoing calls made to this destination address.

Note: This field is not displayed for X.25-LLC2 pseudo interfaces.

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 PVCs.

Example:

```
list all
X.25 Configuration Summary

Node Address: 23785763
Max Calls Out: 15        Inter-Frame Delay:       0
Speed:         9600      Clocking:      External
MTU:           1500 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: 4.00 seconds     N2 timeouts: 20


T2 Timer: 2.00 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

Compression enabled with 5 available dictionaries
Disable Threshold 5000
Min Compress Message Size (for calls without dictionary)  500

X.25 protocol configuration

Prot         Window        Packet-size             Idle
Number        Size           Default Maximum       Time
 0              7            128     256              3


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 #  Compression       Protocol -> X.25 address
 4       0      Enabled     128.185.184.26 -> 21309001122330
 4       0      Enabled     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:

```
X.25 Config>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: 4.00 seconds     N2 timeouts: 20
T2 Timer: 2.00 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

Compression enabled with 5 available dictionaries
Disable Threshold 5000
Min Compress Message Size (for calls without dictionary)  500
```

Example:

```
X.25-LLC2 Config>list detailed
X.25 National Personality Configuration

Follow CCITT: on        OSI 1984:     off       OSI 1988:       on
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    Packet Extended seq mode:   off
Disable Interface Resets:   off
Incoming Calls Barred:    off   Outgoing Calls Barred:      off
Throughput Negotiation:   on    Flow Control Negotiation:   on
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)
Standard Version:     1984      Network Type: CCITT
Window Size     Packet:  7
Packet Size     Default: 128    Maximum: 1024
```

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
```

Protocol Number	Displays the protocol's encapsulation parameters for that protocol: IP, IPX, or DN.
Window Size	Displays the number of packets that can be outstanding before an acknowledgment is sent.
Packet-Size	Displays the default and maximum packet sizes that are configured for the router.
Idle Time	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.
Maximum VCs	Displays the maximum number of VCs that are open to a given destination for a protocol.

pvc

Lists all the defined PVCs.

Note: This command applies only to X.25 network interfaces. It is not available on X.25-LLC2 pseudo interfaces or X.25 Dial Circuits.

Example:

```
list pvc
X.25 PVC configuration

Prtcl    X.25 Address   Window    Pkt_len   Pkt_chan
0        8383838383     4         1024      3
```

Prtcl	Displays the identifier of the protocol running over this PVC, IP, IPX, or DN.
X.25 Address	Displays the destination X.25 address.
Window	Displays the window size of the PVC.
Pkt_len	Displays the maximum length of a packet transmitted over the PVC.
Pkt_chan	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:

```
X.25 Config>list summary
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
```

Example:

```
X.25-LLC2 Config>list summary
X.25 Configuration Summary

Node Address:      21309776655330
Max Calls Out:      4
Default Window:     2          SVC idle:     30 seconds
National Personality: ISO 8881 (DTE)
Inbound         low: 0    high: 0
Two-Way         low: 1    high: 64
Outbound        low: 0    high: 0
Throughput Class in bps Inbound:  2400
Throughput Class in bps Outbound: 2400
```

12.4 X.25 Configuration and Console Commands

Node Address	Displays the local X.25 interface address.
Max Calls Out	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.
Inter-Frame Delay	Displays the minimum number of flags set to be transmitted between frames. **Note:** This field is not displayed for X.25-LLC2 pseudo interfaces or X.25 Dial Circuits.
Default Window	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 assumed value.
SVC idle	Displays the number of seconds that a switched circuit can be idle before it is cleared. The range is 1 to 255.
Max-retries	Displays the maximum number of reset request transmissions permitted before the call is cleared.
National Personality	Displays the *GTE-Telenet* or *DDN* National Personality. GTE-Telenet is the default setting.
PVC (low, high)	Displays the lowest to the highest permanent virtual circuit channel numbers. Zero indicates no PVCs. The range is 0 through 4095. **Note:** This field is not displayed for X.25-LLC2 pseudo interfaces or X.25 Dial Circuits.
Inbound (low, high)	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.
Two-way (low, high)	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.

Outbound (low, high) — 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.

Throughput Class in bps (inbound, outbound) — Displays default throughput capacity (in bits per second) for inbound and outbound traffic.

Dial Type — Displays the type of the X.25 Dial Circuit. The setting is either *Point-to-Point* (default) or *Proprietary*. In Point-to-Point mode the base ISDN line is kept open by sending periodic idle messages. In Proprietary mode the base ISDN connection is allowed to timeout if the line is idle.

List M

Display the current active PVCs and SVCs.

Syntax: list

pvcs
svcs

pvc

Displays the configured permanent virtual circuits.

Example:

list pvcs

svc

Displays the active switched virtual circuits.

Example:

list svcs

```
LCN/  Destination   Call      Out Out  In           Totals   Compression
State Address       Dir Prot Win Pkt  Pkt  Xmts  Rcvs Resets  Tx    Rx

1   D 31            In    IP  7  128  128    77    73     0  Off    Off
2   D 31            In    IP  7  128  128    29    35     0  Off    Off
3   D 50            In    IP  7  128  128    46    48     0  On/H  On/H
4   D 31            In    IP  7  128  128    16    18     0  Off    Off
5   D               In  X25S  7  128  128     6     1     0  Off    Off
63  D              Out  X25S  7  128  128     1     6     0  Off    Off
64  D 31           Out    IP  7  128  128     5     7     0  Off    Off
```

```
D  - Data Transfer     P  - Call Progressing
C  - Call Clearing     H  - Compression History
```

National Disable C

Disable a feature defined by the National Personality configuration.

Syntax: national disable
accept-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`

12.4 X.25 Configuration and Console Commands

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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national disable frame-ext-seq-mode
```

multi-link-addresses

Sets the frame level addresses back to A (03) and B (01).

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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 restart request packet when the router restarts. The default for this feature is ON. Disable this feature only if the switch you are 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 only 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 reset 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
```

12.4 X.25 Configuration and Console Commands

suppress-idle-frame-rr

Enables the sending of idle receiver ready frame layer frames.

Note: This command applies only to X.25 network interfaces. It is not available on X.25-LLC2 pseudo interfaces.

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 throughput class during call setup of SVCs

Example:

`national disable throughput-class-negotiation`

National Enable C

Enable a feature defined in the National Personality configuration.

Syntax: <u>n</u>ational <u>e</u>nable

<u>a</u>ccept-reverse-charges
<u>cc</u>itt
<u>cl</u>ear-w/diag
<u>fl</u>ow-control-negotiation
<u>fr</u>ame-ext-seq-mode
<u>m</u>ulti-link-addresses
<u>osi-84</u>
<u>osi-88</u>
<u>packet-e</u>xt-seq-mode
<u>packet-l</u>ayer-restarts
<u>req</u>uest-reverse-charges
<u>rese</u>t-w/diag
<u>rest</u>art-w/diag
<u>suppress-c</u>alling-addresses
<u>suppress-i</u>dle-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).

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national enable frame-ext-seq-mode
```

12.4 X.25 Configuration and Console Commands

multi-link-addresses

Allows the frame level to use addresses C (0F) and D (07) rather than A (03) and B (01).

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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 C

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 10-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 10-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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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.

12.4 X.25 Configuration and Console Commands

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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national restore DP-timer
```

flow-control-negotiation

Restores the feature that determines the frame's packet size and window size; suitable for call setup negotiation.

Example:

```
national restore flow-control-negotiation
```

frame-ext-seq-mode

Restores the frame layer sequence numbering modulus.

Note: This command applies only to X.25 network interfaces. It is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national restore frame-ext-seq-mode
```

frame-window-size

Restores the default number of frames.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national restore frame-window-size
```

multi-link-addresses

Restores the default value for frame layer addressing.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national restore multi-link-addresses
```

network-type ***CCITT DDN***

Specifies the network convention.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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.

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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 10-second intervals to wait before retransmitting a reset request packet. The range is 0 to 255. A zero in the *timer* value indicates an indefinite wait.

reset-w/diag

Restores the default feature that allows 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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national restore suppress-idle-frame-rr
```

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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. The default is 4.00 seconds.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

`national restore T2-timer`

National Set C

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
idle-frame-timer . . .
network-type . . .
n2-timeouts
packet-size . . .
reset . . .
restart . . .
standard-version
t1-timer
t2-timer

call-req

Specifies the number of 10-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.

Example:

`national set clear-req`

Retries	Number of clear request transmissions permitted before action is taken.
Timer	Number of 10-second intervals to wait before retransmitting a call request packet. A zero in the *timer* value indicates an indefinite wait.

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disconnect-procedure ***passive active***

Specifies the type of disconnect procedure to use when disconnecting.

Note: This command applies only to X.25 network interfaces. It is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national set disconnect-procedure active
```

Passive	Specifies that DISC frames are not 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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national set dp-timer
```

frame-window-size

Specifies the number of frames that can be outstanding before acknowledgement.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national set frame-window-size
```

idle-frame-timer

Specifies the delay before an idle frame is sent to refresh the interface. This is a multiple of T1. For Point-to-Point Dial Circuits, idle frames are sent only if there are active SVCs.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national set idle-frame-timer 5
```

network-type ***CCITT DDN***

Specifies the type of network being supported.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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.

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reset ***retries timer***

Specifies the number of reset request retransmissions.

Example:

```
national set reset
```

Retries	Number of reset request transmissions permitted before the call is cleared. The range is 0 to 255.
Timer	Number of 10-second intervals to wait before retransmitting a reset request packet. The range is 0 to 255. A zero in the *timer* value indicates an indefinite wait.

restart ***retries timer***

Specifies the number of restart request transmissions.

Example:

```
national set restart
```

Retries	Number of restart request transmissions permitted before the call is cleared. The range is 0 to 255.
Timer	Number of 10-second intervals to wait before retransmitting a restart request packet. The range is 0 to 255. A zero in the *timer* 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 hundredths of a second. The range is 0.05 to 255.99. The default is 4.00 seconds.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
national set t1-timer
```

t2-timer

Specifies the amount of time to delay before acknowledging an I-frame. This is an optimization parameter. Setting the timer to 0.00 disables it. The range is 0.00 to 255.99. The default is 2.00.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

national set t2-timer

Parameters M

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 frame layer parameters for an X.25 network interface or the LAN interface and the MAC addresses of the remote DTE and local port for an X.25-LLC2 pseudo interface.

Example:

```
X.25>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
```

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Example:

```
X.25-LLC2>parameters frame
Frame Layer Parameters:
  LAN Interface       = 0, Eth/0
  Remote MAC Address  = 08002BB19F1D
  Local MAC Address   = AA55EE0BB900
```

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.

Note: This command applies only to X.25 network interfaces. It is not available on X.25-LLC2 pseudo interfaces.

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
```

Set C

Configure local X.25 node addresses, maximum number of calls, frame and packet level window size, lowest to highest PVC and SVC channels, compression disable threshold, minimum packet size for data compression on calls with no dictionary and the idle time for a switched circuit.

Syntax: set

address . . .
calls-out . . .
compression-disable-threshold . . .
default-window-size . . .
dial-type
dsap
equipment-type . . .
htf-address . . .
inter-frame-delay . . .
max-retry . . .
minimum-compression-message-size . . .
mtu . . .
national-personality . . .
pvc . . .
speed
ssap
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
```

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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

compression-disable-threshold ***value***

Sets the threshold number of incompressible data bytes at which compression is dynamically disabled. If this number of incompressible bytes are sent in sequence, compression is disabled and the data is transmitted in uncompressed packets. Once disabled, when this number of *compressible* bytes are sent, compression is re-enabled and the data is transmitted in compressed packets again. The range is 1 to 65,535. The default is 5000.

Note: Data compresion is not available on X.25-LLC2 pseudo interfaces.

Example:

set compression-disable-threshold 1000

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

dial-type ***value***

Sets the Dial Circuit type if this device is an X.25 Dial Circuit. The value is either *Point-to-Point* or *Proprietary.* The default is *Point-to-Point.* If the dial type is *point-to-point*, then refresh messages will be sent over the ISDN line at regular intervals, keeping the ISDN line connected. The interval is set by the **national set idle-frame-timer** command.

If the dial-type is *proprietary*, the ISDN line is allowed to go down when there is no X.25 traffic.

Example:

set dial-type proprietary

dsap ***sap***

On X25-LLC2 pseudo devices this command sets the destination SAP for LLC2. The default value 7E(hexadecimal) is the ISO standard SAP for X.25.

Example:

```
set dsap
```

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
```

htf-address ***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.

Note: This command applies only to X.25 network interfaces. It is not available on X.25-LLC2 pseudo interfaces.

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:

Note: This command is not available on X.25-LLC2 pseudo interfaces or X.25 Dial Circuits.

Example:

```
set inter-frame-delay 1
```

max-retry ***value***

Sets the maximum number (*value*) of physical layer retransmissions attempted.

Note: This command is not available on X.25-LLC2 pseudo interfaces or X.25 Dial Circuits.

Example:

```
set max-retry 4
```

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minimum-compression-message-size *value*

Sets the minimum size of a routing packet which will be compressed for calls with no compression dictionary assigned. The range is 1 to 65,535. The default is 500.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
set minimum-compression-message-size 200
```

mtu *value*

Sets the Maximum Transmit Unit (MTU) in bytes. This is the maximum packet size that will be delivered to the X.25 interface for packetization and transmission over the serial line. The range is 576 to 4096. The default is 1500.

If you encounter packet re-assembly timeouts on the X.25 interface, you should determine what the minimum packet size is for all LAN or serial interfaces that lead to the end point, then calculate a more suitable X.25 MTU. You should not directly consider the actual X.25 packet size in this calculation because X.25 tends to use a smaller packet size. X.25 usually sends up to 7 packets at one time before waiting for an acknowledgement.

For example, with a network topology that includes a Token Ring LAN having a packet size of 4000, an X.25 serial line having a packet size of 128 with a window size of 7 and a bit rate of 9600 bps, and an Ethernet LAN with a packet size of 1500, you should probably set the X.25 MTU to 1500. That means that about 12 packets will be sent over the X.25 interface (MTU / X.25 packet size = number of X.25 packets to be sent).

When using an MTU of 4096, 32 packets must be sent over the X.25 interface. (4000 /128 = 31.25) In this case, packet reassembly timeouts will probably occur if the X.25 modem speed is 9600 bps. Using an X.25 modem speed of 56 Kbps should solve this problem.

Example:

```
set mtu 2048
```

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.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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 to 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.)

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
set PVC low 40
```

speed ***value***

Defines the line speed of this interface. The router cannot detect the line speed so you must set this parameter correctly. It is used by SNMP to indicate the speed that the line is operating at, and does not affect actual data transmission rates.

Valid values are in the range 300 to 10,000,000.

Example:

```
set speed
Access rate in bps  [9600]?
```

ssap ***sap***

On X25-LLC2 pseudo devices this command sets the source SAP for LLC2. The default value 7E (hexadecimal) is the ISO standard SAP for X.25.

Example:

```
set ssap
```

svc high-inbound ***or*** **high- two-way** ***or*** **high-outbound**

svc low-inbound ***or*** **low- two-way** ***or*** **low-outbound**

Defines the lowest to the highest switched virtual circuit channel number (*value*).

Example:

```
set SVC low-two-way 1
```

Inbound	Specifies a range of 1 to 255. The default setting is 0; therefore, by default, there are no inbound-only SVCs.

Two-way	Specifies a range of 1 to 255. The default setting is 1 for the **SVC low-** parameter and 64 for the **SVC high-** parameter. By default, there are 64 two-way SVCs.
Outbound	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
```

Statistics M

Display the current statistics of any level of the X.25 configuration, or the current data compression statistics.

Syntax: statistics

all
compression
frame
packet
physical

all

Displays the statistics for the packet, frame, and physical levels.

Example:

```
statistics all
```

compression

Displays the statistics for data compression.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

Example:

```
statistics compression

Destination         Bytes         Compr-        Ratio     On/Off
Address                            essed                  count

123456781       TX: 32896         3971          8.2:1     0
                RX: 31868         3631          8.7:1     0
```

frame

Displays the statistics for the frame level. Note that only I-frames are counted over an X.25-LLC2 pseudo interface.

Example:

```
X.25>statistics frame
Frame Layer Counters:      Received             Transmitted
  Information Frames        1097234                 1091944
  RR Command                    309                     241
  RR Response                   267                    1395
  RNR Command                     0                       0
  RNR Response                    0                       0
  REJ Command                     0                       0
  REJ Response                    0                       0
  SABM                            0                      11
  SABME                           0                       0
  UA                              6                       0
  DISC                            0                       0
  DM                              4                       0
  FRMR                            0                       0

  T1 Timeouts    1    T2 Timeouts         1086    N2 Timeouts    1
  Bad Address    0    Unsolicited F-Bit      0    Invalid Ctl    0

Frame Layer Miscellaneous:
  Queued Output Frames =  0   Protocol Layer State  =  Data Transfer
  Send Sequence N(S)   =  4   Receive Sequence N(R) =  6
```

Example:

```
X.25-LLC2>statistics frame
Frame Layer Counters:      Received              Transmitted
  Information Frames        1101448                  1100893

Frame Layer Miscellaneous:
  Queued Output Frames =  10    State = Data Transfer
```

packet

Displays the statistics for the packet level.

Example:

```
statistics packet
Packet Counters:           Received              Transmitted
  Call Request                 5673                     5669
  Call Accepted                5669                     5673
  Clear Request                5664                     5659
  Clear Confirm                5659                     5664
  Interrupt Request               0                        0
  Interrupt Confirm               0                        0
  RR Packet                  665972                   403117
  RNR Packet                      0                        0
  REJ Packet                      0                        0
  Reset Request                   0                        0
  Reset Confirm                   0                        0
  Restart Request                 4                        6
  Restart Confirm                 0                        0
  Diagnostic                      0                        0
  Data Packet                408432                   665991
  Data Bytes               21254031                 40392356
  Buffers Queued                  0                        4
  Invalid Packets Received =      0
  Switched Circuits Opened =     19
```

physical

Displays the statistics for the physical level.

Note: This command is not available on X.25-LLC2 pseudo interfaces.

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 **C M**

Return to the previous prompt level.

Syntax: exit

Example:

exit

12.5 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 the *System Software Guide*.)

12.5.1 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 statistics display when you run the **interface** command from the GWCON environment for X.25-LLC2 pseudo interfaces:

```
                                Self-Test  Self-Test  Maintenance
Nt Nt’ Interface      CSR  Vec     Passed     Failed       Failed
3  3   X25/1            0    0          0          3            0

  X.25 MAC/data-link on X.25 LLC2 interface
Interface State:  Packet Layer  Frame Layer  LAN Interface (Eth/0)
                       DOWN         DOWN        UP

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
Interface buffer pool: Total = 60, Free = 60
```

The following table describes these general interface statistics:

Nt	Global interface number.
Nt ’	Reserved for future Dial Circuit use.

12.5 X.25 Network Interfaces and the GWCON Interface Command

Intrfc	Interface name.
No	Number of this interface within interfaces of type *intrfc*.
CSR	COMM and Status Registers address.
Vec	Interrupt vector.
Self-Test: Passed	Number of times self-test succeeded.
Self-Test: Failed	Number of times self-test failed.
Maintenance: Failed	Number of maintenance failures.
Interface state	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.
Packet Counters	Provides statistics on packets received and transmitted.
Data Packets	Displays the number of data packets the interface transmits receives on the network.
Data Bytes	Displays the number of data bytes the interface transmits receives on the network.
Buffers Queued	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.
Invalid Packets Received	Displays the number of invalid X.25 packets received from the network.
Switched Circuits Open	Displays the number of switched circuits currently open.
Frame Layer Counters	Provides statistics generated from Frame Layer counters.
Information Frames	Displays the number of X.25 Information frames the interface has transmitted and received.
X.25 Physical Layer Counters	Provides statistics generated from Physical Layer counter.
RX Bytes	Display the number of bytes received by the Physical layer.
TX Bytes	Display the number of bytes transmitted by the Physical layer.

Input frame errors:

Adapter cable	Type of cable.
CRC error	Received cyclic redundancy check does not match transmitted CRC.
alignment byte length	Count of frame alignment errors.
missed frame	Count of missed frames.
too long (> 0 bytes)	Count of frames longer than 2062 bytes.
aborted frame	Count of aborted frames.
DMA/FIFO overrun	Number of times the router was unable to keep up with data being received because the receive buffer was full.
L & F bits not set	Count of last and first bits not set.
DMA/FIFO underrun errors	Number of times the router failed to transmit characters when the transmitter was ready and previously started transmitting a frame.

Interface buffer pool — Displays the total number of buffers preallocated for this interface and the number of remaining free buffers.

Features

13

Configuring and Monitoring the Budget Feature

This chapter describes how to configure budget controls for the router and individual cicuits using the BUD feature.

13.1 About the Budget Feature

The budget feature (BUD) allows you to configure the router to help you monitor and control the costs incurred by Dial Circuits by specifying a target budget.

You use the BUD feature to configure budgets for the router and to allocate a percentage of the overall budget to individual Dial Circuits.

13.1.1 Router-Level Budget

A budget is defined as a total amount of connection time within a given period or as charge units. For example you could limit connections to one hour per day, or ten hours per week.

The router level budget is the overall budget for the router, and limits the total usage of all Dial Circuits on the router. Budget controls can be used on ISDN, V.25 *bis*, Frame Relay SVCs and Frame Relay over ISDN and X.25 over ISDN.

When the Dial Circuit usage reaches the budget limit you can decide whether to block calls (incoming, outgoing or both) and whether to record an error message in the Event Log System. You can also report a warning message if the budget limit is being approached.

To provide a degree of flexibility, you can allow Dial Circuit usage to exceed the defined budget by a specified percentage (up to 100%). This allowance is called an **overdraft**. Any usage of the overdraft facility is effectively borrowed from the next budget period. For example, if the budget limit is 10 hours, with a 50% overdraft, Dial Circuits may be used for 15 hours in one budget period, but then there would only be 5 hours available in the next period.

13.1 About the Budget Feature

If the budget limit is being approached, and would restrict legitimate use of the Dial Circuits, the network administrator can use the **initialise** command to initialize the budget period and refresh the budget allowances in order to prevent calls being blocked.

The budget configuration and status counters are regularly saved into non-volatile memory. This ensures that the budget status information is preserved when the router is powered off, protecting the budget from being reset by switching the router off and back on again.

13.1.2 Circuit Budget

By default, all circuits share the overall router's budget. Any individual circuit is able to use up the entire budget allowance for the router.

To avoid the situation where one Dial Circuit consumes the bulk of the router's budget, you can allocate a percentage of the router's budget to a Dial Circuit. This has to be repeated for each Dial Circuit that you wish to control; otherwise, the system-level budget applies.

There may also be a situation in which you do not want a particular Dial Circuit to be restricted by the router's budget, in which case you can make it exempt by using the **disable budget** command at the `Budget Circuit Config>` prompt.

13.1.3 Fixed Circuits and Budget Controls

When a Dial Circuit has **idle timer** set to 0 it becomes a **fixed circuit** which will not time-out. The budget feature does *not* maintain any timer information on fixed circuits. Line usage on these circuits does not contribute to the budget usage, and these circuits are not disconnected when the budget expires.

If you want to include fixed circuits in the router budget usage statistics, then you could set the Dial Circuit idle timer to its maximum value (65535). Since a fixed circuit is likely to be permanently in use, it should not time-out, and its line usage will be included in the budget usage statistics.

13.2 Accessing the Budget Configuration Environment

You configure budget profiles using the BUD feature.

To access the BUD feature configuration environment, use the **feature bud** command at the `Config>` prompt.

Example:

```
Config>feature bud
Budget configuration
Budget Config>
```

Note: After you access the configuration process, you may begin entering configuration commands. Changes to the configuration of the budget feature take effect **immediately**. You do not have to restart the router.

To access the BUD feature console environment, use the **feature bud** command at the GWCON (+) prompt.

Example:

```
+feature bud
Budget console
Budget>
```

Refer to Chapter 1 for more information about accessing the configuration process.

13.3 Budget Configuration Examples

The following sections provide examples illustrating the use of budget controls.

13.3.1 Configuring a Router-Level Budget

The following procedure describes how to configure a router level budget. In this example we will block outgoing calls if outgoing connection time exceeds 2 hours in any 24 hour period.

1. At the `Config>` prompt enter **feature bud** to display the `Budget Config>` prompt. For example:

   ```
   Config>feature bud
   Budget configuration
   Budget Config>
   ```

13.3 Budget Configuration Examples

2. Use the **enable budget** command to set and enable the system level budget with a period of 24 hours and a time limit of 2 hours for outgoing calls only. For example:

```
Budget Config>enable budget
Budget period (1-65535 days)  [31]?1
Budget limited by time or units (time,units) [TIME]?
Budget time limit (1-65535 hours)  [50]?2
Budget outgoing calls, incoming calls or both (out,in,both) [out]?out
Are the above settings correct (yes/no) [yes] ? y
Budget time enabled, budget units disabled.
```

3. Use the **enable overdraft** command to permit an excess usage of 25% of budget (30 minutes) in any period. Any overdraft time used is borrowed from the next budget period. This means that, in this example, you can use up to 2 hours and 30 minutes in one budget period, but if you do there will only be 1 hour and 30 minutes available in the next period. For example:

```
Budget Config>enable overdraft
Overdraft size (1-100 percent of budget)  [50]?25
```

4. Use the **set expiry-action** command to indicate what action will be taken when the *budget* and *overdraft* limits have been reached. For example, to block outgoing calls and write an ELS message:

```
Budget Config>set expiry-action
Block outgoing calls, block both outgoing and incoming calls or none
(out,both,none) [none]? out
Write ELS message/SNMP trap (yes/no) [yes]? yes
```

5. Use the **enable warning** command to trigger a warning action when 85% of the budget has be used. For example:

```
Budget Config>enable warning
Warning level (1-100 percent of budget)  [90]?85
```

6. Use the **set warning-action** command to indicate what action will be taken when the line usage reaches the warning threshold. For example:

```
Budget Config>set warning-action
Write ELS message/SNMP trap (yes/no) [yes]? yes
```

7. Optionally, you may use the **set check-interval** command to change the interval at which the router checks the line usage statistics against the budget. For example, to set the interval to 10 minutes:

```
Budget Config>set check-interval
check interval (1-65535 minutes)  [15]?10
```

All of these commands take effect immediately. You do not need to restart the router. For convenience the `Budget Config>` process offers the **show** command which lets you monitor budget usage without having to switch to the GWCON process.

13.3.2 Configuring a Budget for a Dial Circuit

The following procedure describes how to restrict one Dial Circuit to use no more than a given percentage of the router's budget controls.

1. At the `Budget Config>` prompt enter the **circuit** command and the number of the circuit you want to configure, to display the `Budget Circuit Config>` prompt. If you are not sure of the circuit numbers, use the **circuit ?** command. For example:

```
Budget Config>circuit ?
 3 (Interface PPP/1)
 4 (Interface PPP/2)
 5 (Interface PPP/3)
 6 (Interface MPB/0)
What is the dial circuit number [0]? 3
Budget Circuit Config>
```

2. Use the **enable budget** command to allocate and activate a percentage of the overall router budget for this circuit. For example, to allocate this circuit 30% of the budget for outgoing calls:

```
Budget Circuit Config>enable budget
Circuit budget (0-100 percent of total budget) [100]?30
Budget outgoing calls, incoming calls or both (out,in,both) [both]?out
Budget enabled on this circuit
```

3. Use the **set expiry-action** command to indicate what action will be taken when the budget for this circuit expires. For example, to block outgoing calls and write an ELS message:

```
Budget Circuit Config>set expiry-action
Block outgoing calls, block both outgoing and incoming calls or none
(out,both,none) [none]? out
Write ELS message/SNMP trap (yes/no) [yes]? yes
```

4. Use the **enable overdraft** command to permit this circuit to use the overdraft facility. It will have the same percentage of the overdraft as it does of the budget. For example:

```
Budget Circuit Config>enable overdraft
Overdraft enabled on this circuit
```

5. Use the **enable warning** command to trigger a warning when 85% of the circuit budget has be used. For example:

```
Budget Circuit Config>enable warning
Warning level (1-100 percent of circuit budget)  [90]?85
Warning enabled on this circuit
```

6. Use the **set warning-action** command to indicate what action will be taken when the line usage reaches the warning threshold. For example:

```
Budget Circuit Config>set warning-action
Write ELS message/SNMP trap (yes/no) [yes]? yes
```

13.3.3 Trapping Budget Events

Although the **set warning action** and **set expiry action** commands request that the budget subsystem should write ELS messages, the messages will *not* be displayed or reported unless you instruct the Event Logging System (ELS) to display and/or trap these messages.

The budget event messages which are enabled by these commands are described in Table 13–1. For a full explanation of all of the events which can be reported by the budget subsytem, refer to the *Event Logging System Messages Guide*.

Table 13–1 Budget Event Messages

Reason	Action Type	Router Level ELS Message	Circuit Level ELS Message
Budget Threshold reached	Warning	BUD.001	BUD.003
Budget Overdraft started	Warning	BUD.005	BUD.006
Budget and Overdraft expired	Expiry	BUD.002	BUD.004

The following procedure describes how to configure ELS to trap the router level and circuit level budget warning and action events which you have enabled in the budget configuration procedures. Trapped events are reported to SNMP.

1. At the `Config>` prompt enter the **event** command to access the ELS configuration procedure. For example:

```
Config>event
Event Logging System user configuration
ELS config>
```

2. Use the **trap event** command to request that specific budget event messages are trapped and reported by ELS. For example, to report router level budget threshold warning (BUD.001) use this command:

```
ELS Config>trap event BUD.001
ELS Config>
```

3. Alternatively, if you want to report all budget information level events you can use the **trap subsystem** command instead, for example:

```
ELS Config>trap subsystem BUD U-INFO
ELS Config>
```

4. Similarly, if you want to display ELS messages on the console use the **display** command to select individual messages or all messages from a subsystem:

```
ELS Config>display subsystem BUD
ELS Config>
```

5. When you have set the traps you require, return to the Config> prompt:

```
ELS Config>exit
Config>
```

For more information about using the ELS configuration process, refer to the *System Software Guide*. For information about using SNMP or RMON to process trapped event messages refer to the *Routing Protocols User's Guide.*

13.4 Budget Configuration Commands

This section summarizes and explains the BUD configuration and monitoring commands.

The BUD configuration commands allow you to configure budget controls. Enter the BUD configuration commands at the `Budget Config>` prompt.

The BUD monitoring commands allow you to monitor budget controls. Enter the BUD monitoring commands at the `Budget>` prompt.

See Section 13.2 for more information about accessing the configuration and monitoring environments.

13.4 Budget Configuration Commands

Table 13–2 lists the BUD configuration commands:

Table 13–2 Budget Configuration and Console Commands Summary

Command	Task	Function
? (Help)	Configure/ Monitor	Lists all the budget configuration or monitoring commands, or lists the options associated with specific commands.
Circuit	Configure	Accesses the Circuit-level budget configuration process or lists configurable Dial Circuits.
Disable	Configure	Disables budget controls, overdrafts or warnings.
Enable	Configure	Enables budget controls, overdrafts or warnings.
Initialise	Configure	Starts a new budget period.
List	Configure	Displays the current budget configuration at router level and for individual circuits.
Set	Configure	Sets the check interval, expiry action or warning action.
Show	Configure/ Monitor	Displays the current budget usage statistics.
Exit	Configure/ Monitor	Exits the budget configuration or monitoring process and returns to the previous prompt.

? (Help) C M

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:

?

```
CIRCUIT
DISABLE
ENABLE
EXIT
INITIALISE
LIST
SET
SHOW
```

13.4 Budget Configuration Commands

Circuit C

Accesses the `Budget Circuit Config>` prompt. Use this prompt to enter commands which configure the budget for the Dial Circuit specified by the parameter *circuit-number.*

Refer to Section 13.5 for an explanation of the commands available at the `Budget Circuit Config>` prompt.

Syntax: circuit *circuit-number*

Example:

```
circuit
 What is the dial circuit number [0]?
```

circuit-number — The interface number of the Dial Circuit. If the specified interface is not a Dial Circuit, then the following error message will be displayed:

`Not a valid dial circuit`

Note: The default value is 0, which is never a valid Dial Circuit.

To find the valid dial circuit interface numbers, use the **circuit ?** command. This displays a list of the Dial Circuits which can be configured for a circuit budget, and then prompts for the number of the Dial Circuit you want to configure.

Example:

```
circuit ?
 3 (Interface PPP/1)
 4 (Interface PPP/2)
 5 (Interface PPP/3)
 6 (Interface MPB/0)
What is the dial circuit number [0]?3
```

13.4 Budget Configuration Commands

Disable C

Disables budget controls, overdraft capability or warning thresholds for the whole router.

Note: You must disable budget controls before using the `Config>` **clear all** and **clear device** commands to clear all non-device configuration information. You must then restart the router to synchronize budgeting with the cleared configuration.

Syntax: disable
budget
overdraft
warning-threshold

budget

Disables budget controls for the router. No budget monitoring will be performed.

Example:

```
disable budget
All budget controls disabled
```

overdraft

Disables the overdraft capability across the whole router. No line usage will be permitted when the budget control thresholds have been reached.

Example:

```
disable overdraft
All overdrafts disabled
```

warning-threshold

Disables all warning messages indicating that budget thresholds are being approached.

Example:

```
disable warning-threshold
Warning disabled on overall budget
```

13.4 Budget Configuration Commands

Enable C

Enables budget controls, overdraft capability or warning thresholds for the whole router.

Syntax: enable

budget
overdraft
warning-threshold

budget

Enables budget controls for the router. The budget controls can monitor usage in terms of the time that calls are connected or by the number of charged dial units that are used. Refer to your service provider to determine whether charge units can be monitored, and for the significance of a charge unit.

Note: If the line usage goes over budget and overdraft, you can initialize the budget period and refresh the budget allowances by disabling the budget and then enabling it again. Use the **disable budget** command followed by the **enable budget** command. Since these commands take effect immediately there is no need to restart the router between commands.

Example:

```
enable budget
Budget period (1-65535 days)  [31]?
Budget limited by time or units (time,units) [TIME]?
Budget time limit (1-65535 hours)  [50]?
Budget outgoing calls, incoming calls or both (out,in,both) [out]?
Are the above settings correct (yes/no) [yes] ?
Budget time enabled, budget units disabled.
```

Example:

```
enable budget
Budget period (1-65535 days)  [31]?
Budget limited by time or units (time,units) [TIME]? unit
Budget charge limit (1-400000000 units)  [6000]?
Budget outgoing calls, incoming calls or both (out,in,both) [out]?
Are the above settings correct (yes/no) [yes] ?
Budget units enabled, budget time disabled.
```

Budget period	The number of days that each budget is active. The initial default is 31.

13.4 Budget Configuration Commands

Budget limited by time or units	Determine whether the budget tracks the *time* that calls are connected, or the dial *units* that are used.
Budget time limit	The maximum number of hours of line usage that are permitted within any *budget period*.
Budget charge limit	The maximum number of charge units that can be used by Dial Circuits within any *budget period*.
Budget outgoing calls, incoming calls or both	The direction of calls to which these budget controls apply: **out** – outbound calls only **in** – inbound calls only **both** – inbound and outbound calls
Are the above settings correct	Confirm that the settings are correct before enabling them. If you answer no, then budget is not enabled.

overdraft

Enables the overdraft capability across the whole router. Line usage will be permitted when the budget control thresholds have been exceeded, up to the overdraft limit.

Example:

```
enable overdraft
Overdraft size (1-100 percent of budget)  [50]?
```

Overdraft size	The percentage of the *budget time* or *budget charge limit* which can be used as an overdraft. Any line usage taken as an overdraft in one budget period is deducted from the time available in the next budget period.

warning-threshold

Enables warning messages indicating that line usage is approaching the budget thresholds.

Example:

```
enable warning-threshold
Warning level (1-100 percent of budget)  [90]?
```

Warning level	The percentage of the *budget time* which can be used before a warning message is issued.

Initialise C

Resets budget controls to the start of a budget period and resets all status counters, restoring 100% of budget allowances for the period.

Note: If the current usage is into the overdraft limit, then using the **initialise** command once leaves the amount of overdraft as the current usage. You must use the **initialise** command twice to clear the budget and overdraft.

Syntax: initialise

Example:

```
initialise
budget initialised
```

List C

Display the current configuration of budget controls.

Syntax: list
all
summary

all

Displays budget control configuration at the router level, followed by the budget controls that have been set for each Dial Circuit which has been configured with its own budget controls.

13.4 Budget Configuration Commands

Example:

```
list all
Budget Controls       enabled on outgoing and incoming calls
Period                7 days
Time limit            disabled
Charge limit          6000 units
Overdraft             50 percent
Warning threshold     90 percent
Check interval        15 mins
Expiry action
    incoming calls    not blocked
    outgoing calls    not blocked
    ELS message/trap  enabled
Warning action
    ELS message/trap  enabled
-------------------------- Net 3 --------------------------
Circuit destination name   ipx-215
Budget Controls            enabled on outgoing and incoming calls
Budget level               10 percent
Overdraft                  disabled
Expiry action
    incoming calls         blocked
    outgoing calls         blocked
    ELS message/trap       enabled
Warning action
    ELS message/trap       enabled at 90 percent of circuit budget
```

Budget Controls	Indicates whether budget controls are **enabled** or **disabled** at the router level. If controls are enabled, it also indicates in which direction.
Period	Indicates the duration of each budget period, in days.
Time limit	Indicates the maximum connection time, in hours, for all calls on the router in any one budget *period*. It is set to **disabled** if the budget is monitoring charge units.
Charge limit	Indicates the maximum number of charge units that can be used for all calls on the router in any one budget *period*. It is set to **disabled** if the budget is monitoring connection time.
Overdraft	Indicates the percentage of the *time limit* or *charge limit* which can be used as an overdraft. Any line usage taken as an overdraft in one budget period is deducted from the usage available in the next budget period.

Warning threshold	Indicates the percentage of the *time limit* or *charge limit* which can be used before a warning message is issued.
Check interval	Indicates the interval, in minutes, at which the line usage is checked against the budget controls.
Expiry action	
Incoming calls	Indicates whether incoming calls are **blocked** or **not blocked** when the budget time limit, at the router level, plus permitted overdraft have been reached.
Outgoing calls	Indicates whether outgoing calls are **blocked** or **not blocked** when the budget time limit, at the router level, plus permitted overdraft have been reached.
ELS message/trap	Indicates whether the ELS message BUD.002 and related SNMP trap is issued when the budget controls, at the router level, are exceeded: **enabled –** ELS message is issued **disabled** – ELS message is not sent.
Warning message	
ELS message/trap	Indicates whether ELS messages BUD.001 and related SNMP trap is issued when the budget warning threshold, at the router level, has been reached: **enabled –** ELS message is issued **disabled** – ELS message is not sent.

The following fields are repeated for each circuit that has been individually configured.

----- *Net n* -----	Indicates the interface number of the Dial Circuit being displayed.
Circuit destination name	Indicates the destination name of the Dial Circuit. All configuration parameters relate to the named circuit only.
Budget Controls	Indicates whether budget controls are **enabled** or **disabled** for this circuit. If controls are enabled, it also indicates in which direction.

13.4 Budget Configuration Commands

Budget level — The maximum percentage of the router level budget which this circuit is permitted to use. For example, if *budget level* is set to 10%, then this circuit can use up to 10% of the router-level budget (*time limit* or *charge limit*) plus 10% of the router-level overdraft allowance.

This value cannot exceed 100% of the budget, for any individual circuit, but the total percentage allocated to all configured circuits may exceed 100%.

For example, four circuits may each allocated 30% of the budget, but the total usage across these circuits is still restricted to the router level *time limit* (or *charge limit*).

Overdraft — Indicates whether this Dial Circuit is permitted to use the overdraft facility:

enabled – This circuit can use the percentage of the router's overdraft specified by *budget level.*

disabled – This circuit cannot use the overdraft facility.

Expiry action

Incoming calls — Indicates whether incoming calls on this circuit are **blocked** or **not blocked** when the budget time limit plus permitted overdraft have been reached.

Outgoing calls — Indicates whether outgoing calls on this circuit are **blocked** or **not blocked** when the budget time limit plus permitted overdraft have been reached.

ELS message/trap — Indicates whether ELS messages and related SNMP trap are issued when the budget controls on this circuit are exceeded:

enabled – ELS messages are issued

disabled – ELS messages are not sent.

Warning message

ELS message/trap	Indicates whether ELS messages and related SNMP trap is issued when the budget warning threshold on this circuit has been reached: **enabled at *nn* percent of circuit budget –** ELS messages are issued when usage reaches *nn*% of the budget allowance for this circuit. The value of *nn* is taken from the router level *Warning threshold.* **disabled** – ELS messages are not sent.

summary

Displays budget control configuration at the router level.

Example:

```
list summary
Budget Controls       enabled on outgoing and incoming calls
Period                7 days
Time limit            disabled
Charge limit          6000 units
Overdraft             50 percent
Warning threshold     90 percent
Check interval        15 mins
Expiry action
    incoming calls    not blocked
    outgoing calls    not blocked
    ELS message/trap  enabled
Warning action
    ELS message/trap  enabled
```

Set C

Define the interval at which to check the budget status and the actions to take when enabled budget control thresholds are reached.

Syntax: set

check-interval
expiry-action
warning-action

13.4 Budget Configuration Commands

check-interval

Sets the interval at which the line usage statistics are checked.

Example:

```
set check-interval

Check interval (1-65535 minutes)  [15]? 20
```

Check interval	The interval, in minutes, at which the line usage statistics are compared to the budget control thresholds.

expiry-action

Sets the action which is to be taken whenever line usage exceeds the budget maximum time plus overdraft (if appropriate).

Example:

```
set expiry-action
Block outgoing calls, block both outgoing and incoming calls or none
(out,both,none) [none]?
Write ELS message/SNMP trap (yes/no) [yes]?
```

Block outgoing calls, block both outgoing and incoming calls or none	The action which is to be taken when line usage in the current period exceeds the budget and overdraft: **out** – Block outgoing calls. **both** – Block both outgoing and incoming calls. **none** – Do not block any calls. (Default)
Write ELS message/SNMP trap	The reporting action which is to be taken when router level line usage in the current period exceeds the budget and overdraft: **yes** – Report budget expiry with an Event Log message. Use `ELS Config>` to trap the message for SNMP if required. (Default) **no** – Do not report budget expiry.

warning-action

Sets the action which is to be taken whenever line usage approaches the budget maximum time.

Example:

```
set warning-action
Write ELS message/SNMP trap (yes/no) [yes]?
```

Write ELS message/SNMP trap	The reporting action which is to be taken when router-level line usage in the current period reaches the warning threshold for the budget. **yes** – Report budget warning with an Event Log message. Use `ELS Config>` to trap the message for SNMP if required. (Default) **no** – Do not report budget warning.

Show C M

Display the current status of Dial Circuit usage and budget timers. This command is used for monitoring budget status. It is included in the configuration process for convenience since all of the BUD feature commands take effect immediately.

Syntax: show
all
summary

all

Displays budget control status at the router level, and for each Dial Circuit which has been configured with its own budget controls.

Example:

```
show all
Budget Controls            enabled on outgoing and incoming calls
Time since budget start    3 days 0 hrs(42%), 4 days 0 hrs remaining
Connection time used       36 mins(15% of budget: not expired)
Charge units used          40
Overdraft of 50 % is enabled

----------------- Net 3 Interface PPP/1 -----------------
Connection time used       0 mins
Charge units used          0
Overdraft                  enabled
```

13.4 Budget Configuration Commands

```
----------------- Net 6 Interface MPB/0 -----------------
Connection time used       36 mins(15% of budget: not expired)
Charge units used          40
Overdraft                  enabled
```

Budget Controls	Indicates whether budget controls are **enabled** or **disabled** for this circuit. If controls are enabled, it also indicates in which direction.
Time since budget start	Indicates the number of days and hours since the current budget period started, the percentage of the current period which has elapsed, and how many days and hours remain until the next period.
Connection time used	Indicates the number of minutes of connection time that have been used by all circuits on this router during the current period.
Overdraft	Indicates whether the overdraft facility is enabled or not. If it is enabled it also indicates the extent of the overdraft as percentage of the budget: **enabled** – The overdraft facility is available. **disabled** – The overdraft facility is not available.
Net n Interface PPP/m	Indicates the interface number and name of the Dial Circuit.
Connection time used	Indicates the number of minutes of connection time that have been used by this Dial Circuit during the current period.
Overdraft	Indicates whether this Dial Circuit is permitted to use the overdraft facility: **enabled** – This circuit can use the percentage of the router's overdraft specified by *budget level.* **disabled** – This circuit cannot use the overdraft facility.

summary

Displays budget control status for the router level only.

Example:

```
show summary
Budget Controls            enabled on outgoing and incoming calls
Time since budget start    3 days 1 hr(43%), 3 days 23 hrs remaining
Connection time used       176 mins
Charge units used          0

Overdraft of 50 % is enabled
```

Exit C M

Return to the previous level prompt.

Syntax: exit

Example:

```
exit
```

13.5 Budget Circuit Configuration Commands

This section summarizes and explains the budget circuit configuration commands.

The budget circuit configuration commands allow you to configure budgets for individual Dial Circuits. You can specify what percentage of the overall budget for the router will be available for each circuit and you can change the warning and expiry actions to be taken per circuit.

Enter the budget configuration commands at the `Budget Circuit Config>` prompt.

Table 13–3 lists the budget circuit configuration commands.

Table 13–3 Budget Circuit Configuration Commands Summary

Command	Configure/ Monitor	Function
? (Help)	Configure	Lists all the budget circuit configuration commands or lists the options associated with specific commands.
Delete	Configure	Deletes all budget controls for this circuit.
Disable	Configure	Disables budget controls, overdrafts or warnings for the circuit.
Enable	Configure	Enables budget controls, overdrafts or warnings for the circuit.
List	Configure	Displays the current configuration of the budget controls for this circuit.
Reset-to-Default	Configure	Resets the configuration of the budget controls to their default values.
Set	Configure	Sets the expiry action or warning action for this circuit.
Show	Configure	Displays the current budget usage statistics for this circuit.
Exit	Configure	Exits the budget circuit configuration process and returns to the `Budget Config>` prompt.

13.5 Budget Circuit Configuration Commands

? (Help) C

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:

```
?
DELETE
DISABLE
ENABLE
EXIT
RESET-TO-DEFAULT
LIST
SET
SHOW
```

Delete C

Removes all circuit level budget control definitions for this circuit. This is the default state for circuits. Controls do not exist until they have been created using the **set** and **enable** or **disable** commands.

When circuit level budget is deleted the circuit has no specific restrictions, and the circuit usage statistics are not monitored by the system. However the router-level budget still applies. Note that a Dial Circuit which has no circuit level budget may use the entire budget for the router.

Syntax: delete

Example:

```
delete
Circuit budget deleted, the overall budget now applies
```

13.5 Budget Circuit Configuration Commands

Disable C

Disables budget controls, overdraft capability or warning thresholds for the circuit.

Syntax: disable

budget
overdraft
warning-threshold

budget

Disables budget controls for this circuit. No budget monitoring will be performed on this circuit.

Note: If you disable the budget on a circuit it is exempt from the router level budget controls and has *unlimited* access to the network. If you want to cancel a circuit budget after it has been configured, then you should use the **delete** command.

Example:

```
disable budget
Budget disabled, unlimited calls allowed on this circuit
```

overdraft

Disables the overdraft capability on this circuit.

Example:

```
disable overdraft
Overdraft disabled on this circuit
```

warning-threshold

Disables warning messages indicating that budget thresholds are being approached on this circuit.

Example:

```
disable warning-threshold
Warning disabled on this circuit
```

13.5 Budget Circuit Configuration Commands

Enable C

Enables budget controls, overdraft capability or warning thresholds for the circuit being configured.

Syntax: enable

budget
overdraft
warning-threshold

budget

Enables budget controls for the circuit. The budget for a circuit is given as a percentage of the total budget for the router and cannot exceed 100% for any single circuit. If the percentages allocated to several Dial Circuits exceeds 100%, then each circuit may use up to its allocation providing the total usage on the router is within the router's budget.

Example:

```
enable budget
Circuit budget (0-100 percent of total budget) [100]?
Budget outgoing calls, incoming calls or both (out,in,both) [both]?
Budget enabled on this circuit
```

Circuit budget	The percentage of the router's budget that is allocated to this circuit. **Note:** If this is set to 0, then the budget for this circuit is permanently expired. So, if the expiry policy is to block calls then this circuit cannot be used.
Budget outgoing calls, incoming calls or both	The direction of calls to which these budget controls apply: **out** – outbound calls only **in** – inbound calls only **both** – inbound and outbound calls

overdraft

Enables the overdraft capability on this circuit. The amount of overdraft is a percentage of the router level overdraft. The percentage allocated for the Dial Circuit is specified as the circuit budget in the **enable budget** command.

13.5 Budget Circuit Configuration Commands

For example, if the router level budget time limit is 4 hours, the router level overdraft is 50% and the circuit level budget is 10%, the circuit level overdraft is 5% of 4 hours (12 minutes).

Example:

```
enable overdraft
Overdraft enabled on this circuit
```

warning-threshold

Enables warning messages indicating that usage of this Dial Circuit is approaching the budget thresholds.

Example:

```
enable warning-threshold
Warning level (1-100 percent of circuit budget) [90]?
Warning enabled on this circuit
```

Warning level	The percentage of the budget for this circuit which can be used before a warning message is issued.

List C

Display the current configuration of circuit budget controls.

Syntax: list

Example:

```
list
Budget Controls           enabled on outgoing and incoming calls
Budget level              10 percent
Overdraft                 disabled
Expiry action
    incoming calls        blocked
    outgoing calls        blocked
    ELS message/trap      enabled
Warning action
    ELS message/trap      disabled
```

Budget Controls	Indicates whether budget controls are **enabled** or **disabled** for this circuit. If controls are enabled, it also indicates in which direction.

Budget level — The percentage of the router level budget (*time limit or charge limit*) and *overdraft* which this circuit is permitted to use.

Overdraft — Indicates whether this Dial Circuit is permitted to use the overdraft facility:

- **enabled** – This circuit can use the percentage of the router's overdraft specified by *budget level.*
- **disabled** – This circuit cannot use the overdraft facility.

Expiry action

Incoming calls — Indicates whether incoming calls on this circuit are **blocked** or **not blocked** when the budget limit plus permitted overdraft have been reached.

Outgoing calls — Indicates whether outgoing calls on this circuit are **blocked** or **not blocked** when the budget limit plus permitted overdraft have been reached.

ELS message/trap — Indicates whether ELS messages and related SNMP trap are issued when the budget controls on this circuit are exceeded:

- **enabled –** ELS messages are issued
- **disabled** – ELS messages are not sent

Warning message

ELS message/trap — Indicates whether ELS message and related SNMP trap are issued when the budget warning threshold on this circuit has been reached:

- **enabled –** ELS messages are issued
- **disabled** – ELS messages are not sent

Reset-to-Default C

Resets budget control values to their default values:

- **Budget controls** – enabled on outgoing and incoming calls
- **Budget level** – 100 percent
- **Overdraft** – disabled

13.5 Budget Circuit Configuration Commands

- **Expiry action**

  incoming calls – not blocked

  outgoing calls – not blocked

  ELS message/trap – enabled

- **Warning action**

  ELS message/trap – disabled

When you enable a router-level budget, there are no circuit-level budgets defined, so the system does not monitor usage of the circuits. If you use the **reset-to-default** command the budget level for the circuit is set to 100%, which means that there is no particular restriction for this circuit, but the system will monitor usage of the circuit. If you repeat this for all available circuits, then the `Budget>` **show all** command can identify which circuits are most active.

Syntax: reset-to-default

Example:

```
reset-to-default
```

Set C

Define the actions to take when enabled budget control thresholds are reached on this circuit.

Syntax: set

expiry-action

warning-action

expiry-action

Sets the action which is to be taken whenever the usage of this circuit exceeds the budget maximum time plus overdraft (if appropriate).

Example:

```
set expiry-action
Block outgoing calls, block both outgoing and incoming calls or none
(out,both,none) [none]?
Write ELS message/SNMP trap (yes/no) [yes]?
```

Block outgoing calls, block both outgoing and incoming calls or none	The action which is to be taken when usage of this circuit in the current period exceeds the budget and overdraft: **out** – Block outgoing calls. **both** – Block both outgoing and incoming calls. **none** – Do not block any calls. (Default)
Write ELS message/SNMP trap	The reporting action which is to be taken when circuit usage in the current period exceeds the budget and overdraft: **yes** – Report budget expiry with an Event Log message. Use `ELS Config>` to trap the message for SNMP if required. (Default) **no** – Do not report budget expiry.

warning-action

Sets the action which is to be taken whenever circuit usage approaches the budget maximum time.

Example:

```
set warning-action
Write ELS message/SNMP trap (yes/no) [yes]?
```

Write ELS message/SNMP trap	The reporting action which is to be taken when circuit usage in the current period reaches the warning threshold for the budget: **yes** – Report budget warning with an Event Log message. Use `ELS Config>` to trap the message for SNMP if required. (Default) **no** – Do not report budget warning.

13.5 Budget Circuit Configuration Commands

Show C

Display the current status of circuit usage and budget timers.

Syntax: show

Example:

```
show
Time since budget start    3 days 0 hrs(42%), 4 days 0 hrs remaining
Connection time used       28 mins(15% of budget: not expired)
Charge units used          31
Overdraft                  disabled
```

Time since budget start — Indicates the number of days and hours since the current budget period started, the percentage of the current period which has elapsed, and how many days and hours remain until the next period.

Connection time used — Indicates the number of minutes of connection time that have been used on this Dial Circuit during the current period and the percentage of the budget that has been used.

Comparing the percentage of the budget used with the percentage of the budget period that has elapsed indicates whether the current rate of usage is likely to exceed the budget.

Overdraft — Indicates whether this Dial Circuit is permitted to use the overdraft facility:

enabled – This circuit can use the percentage of the router's overdraft specified by *budget level.*

disabled – This circuit cannot use the overdraft facility.

Exit C

Return to the `Budget Config>` prompt.

Syntax: exit

Example:

```
exit
```

14

Configuring and Monitoring the Telesaving Feature

This chapter describes how to configure Telesaving profiles using the TEL feature.

14.1 About the Telesaving Feature

The Telesaving feature (TEL) allows you to configure the router to help you optimize the use of Dial Circuits and control the costs.

You use the TEL feature to configure profiles for call-blocking, call-back and initial minimum timers.

14.1.1 Call Bocking Profile

Use a call-blocking profile to prevent, or permit, incoming and outgoing calls at certain times of the week. For some sites it may be appropriate to prevent calls in out-of-hours periods.

When using the call-blocking feature you should be aware of the following points:

- Calls may be blocked by **budget** *or* **call-blocking**. If either function is in a blocking band or period, calls will be blocked.
- If call-blocking is used on a Multilink PPP bundle the restrictions apply to all circuits in the bundle.
- Calls blocked incoming and outgoing are recorded in the Telesaving MIB.
- Calls that terminate prematurely (before the Initial Minimum Timer period) are recorded in the Telesaving MIB as *Short Calls*.

14.1.2 Call-Back Profile

Use a call-back profile to enable the router to call-back to a remote system when accepting an incoming call, or to request call-back when you make an outgoing call during the periods you specify.

14.1 About the Telesaving Feature

Call-back can be used by the central site/head office to increase security and to centralize billing. With centralized billing the organization may be able to take advantage of discounts for high usage.

When using the call-back feature you should be aware of the following points:

- The Acceptor must have the Calling Line Identifier (CLID) facility. This is optional at the Requestor's end.
- The Acceptor can still process call-back requests if incoming calls are blocked by a call-blocking profile. If outgoing calls are blocked however, both call-back Acceptor or Requestor will not function.
- If call-back is used on a Multilink PPP bundle, it applies to all the circuits in the bundle.
- Call-back response calls (from the Acceptor) are recorded in the Telesaving MIB.

14.1.2.1 Call-Back Accept Delay and Request Wait Timers

The Accept Delay and Request Wait timers are used to allow for latency in the network when processing a call-back request. They should be set to the required values for those periods (timebands) when call-back is enabled.

If a timeband specifies *Accept*, the **Accept Delay** timer is used as a short, turnaround interval between clearing the incoming call (call request) and placing the outgoing (call-back) call.

If a timeband specifies *Request* the **Request Wait** timer is used as the period which the call-back requestor will wait for a call-back response before trying another call-back request.

The sequence of actions is normally:

1. **Requestor** – Issues a call-back request.
2. **Acceptor** – Receives and validates the request, clears the call and starts the short *Accept Delay* timer.
3. **Requestor** – Receives the call cleared indication and starts the *Request Wait* timer.
4. **Acceptor** – When the *Accept Delay* timer expires the Acceptor issues a call-back response call to the Requestor.

5. **Requestor** – Receives the call-back response call, stops the *Request Wait* timer and accepts the call.

If the call-back response, issued in step 4, fails then the Acceptor starts a timer which lasts 50% of its own Request Wait timer interval. When that timer expires the Acceptor repeats the call-back response. Providing that the Request Wait timer at *both* stations is the same, the second call-back response should be received before the Request Wait timer expires at the requesting station.

If the Request Wait timer expires before the Requestor receives the call-back call the sequence starts again from the top.

14.1.3 Initial Minimum Timer Profile

The Initial Minimum Call Timer (IMT) is defined by the Initial Minimum Timer profile, which specifies how long a Dial Circuit will be kept connected when it has just been set up. The call is held open regardless of whether any data is flowing, unless the call is cleared by the remote end or some higher management function.

The main purpose of this timer is to use time which has already been paid for. If the service provider makes an initial call charge, then use this timer to ensure that the call is kept open until the period paid for has expired. If your system might make several short calls during the time that is covered by the initial call charge, this timer ensures you incur the initial call charge only once.

If there is no initial call charge this timer can be set to 0 (zero) and the idle timer will control disconnection.

When using the Initial Minimum Call Timer feature you should be aware of the following points:

- Initial minimum call timer is effectively inactive if the value is less than the setting of “Idle Timer” on a given Dial Circuit.
- When initial minimum call timer (IMT) is greater than the Idle Timer (usual case), the initial minimum call timer runs for IMT minus Idle seconds and then Idle timer is started.
- IMT is also used on all Multilink PPP links. Note that the **Idle Timer** is only configured on the “base” or primary link of a Multilink PPP bundle, and that value is also used on secondary links.

14.1.4 Telesaving MIB

Refer to the *Routing Protocols User's Guide* for more information about the Telesaving MIB. There is an appendix in this guide which covers all supported MIBs, and provides detailed information on the Telesaving MIB in particular.

14.1.5 Reserved Profile Names

There are two reserved names for telesaving profiles: **DEFAULT** and **ALL**.

Each type of profile has a profile called **DEFAULT** which is configured with a set of default values. You cannot delete the default profiles, but you can create customized profiles which you use instead of the default.

The name **ALL** is used in several commands to indicate that you want to select all of the defined profiles.

14.1.6 System Time and Date

Telesaving makes use of the current date and time settings on the router, so you must ensure that these have been set correctly before you configure and use the Telesaving feature.

You can obtain the time from a network time server or you can set it manually. If your router has a built-in Time of Year clock, you need to set the time just once, and it will keep time across restarts; otherwise, you must reset the clock every time you restart the router.

For example, you can use the **time set** command at the `Config>` prompt.

Example:

```
Config>time set
year [1997]? 1998
month [1]? February
date [1]?23
hour [0]?11
minute [0]?25
second [0]?
```

Refer to the *System Software Guide* for more details about using the **time** command.

14.1.7 Profile Timebands

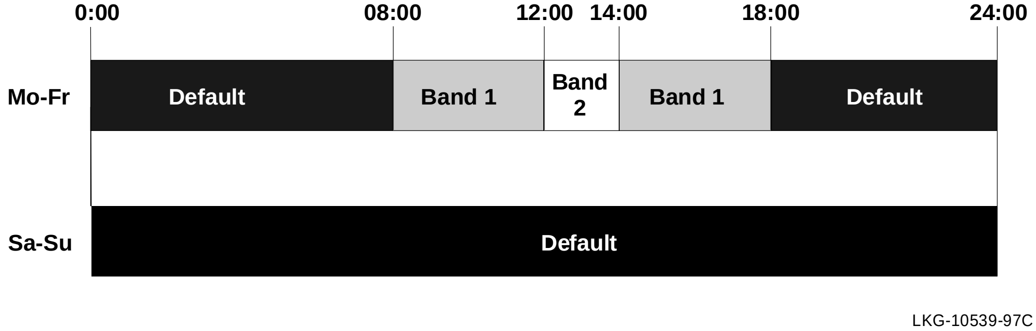
Each profile has a set of **default** actions which apply at all times. The actions depend on the type of profile. If you want different actions to be taken at different times of the week you can define a number of timebands, and specify what action to take when each timeband is active.

Note: If the time of week has not been set or resolved, then all profiles will use the default action settings at all times.

Timebands are identified by a band number and are defined by a range of days and a range of hours **within each day**. For example, Band 1 might be defined as being between the hours of 08:30 and 18:00 daily from Monday through Friday.

Each profile may have up to **5** timebands and the default setting. If any timebands overlap, the later band has priority. The example in Figure 14–1 shows a profile where timeband 2 overlaps timeband 1.

Figure 14–1 Profile With Overlapping Timebands



The timebands are defined as:

- **Default** – All day every day, except when a configured timeband is active
- **Band 1** – Monday to Friday, starting at 08:00 and ending at 18:00
- **Band 2** – Monday to Friday, starting at 12:00 and ending at 14:00

During each weekday, the default actions apply from 0:00 until 08:00. Band 1 is active from 08:00 to 12:00. Band 2 becomes active from 12:00 to 14:00 (overriding Band 1). When Band 2 ends, Band 1 becomes active again from 14:00 to 18:00. The default band resumes from 18:00 until 24:00. The default is also active on Saturday and Sunday because there are no defined bands for the weekend in this example.

14.1.8 Setting a Dial Circuit to Use a Telesaving Profile

By default, Dial Circuits use the profiles called **DEFAULT**. You can override this by specifying a named profile.

At the `Circuit Config>` prompt you use the **set blocking**, **set call-back** and **set initial-minimum-timer** commands to configure the circuit to use named profiles configured using the TEL feature, the **default** profile or **None**. If you set a telesaving profile to None, then that feature is not used.

14.2 Accessing the Telesaving Configuration Environment

You configure Telesaving profiles using the TEL feature.

To access the TEL feature configuration environment, use the **feature tel** command at the `Config>` prompt.

Example:

```
Config>feature tel
Telesaving profiles configuration
Profile Config>
```

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

Refer to Chapter 1 for more information about accessing the configuration process.

14.2.1 Monitoring Telesaving Performance

The TEL feature does not have any console commands, but the Initial Minimum Timer is displayed by the `ISDN>` **timer** command.

There is a web-based Telesaving Monitoring tool provided with the Router Configurator software. This monitoring tool displays a graphic image of the budget usage at system and circuit level on the router, and can display a snapshot of the Telesaving MIB System group contents for the router or the Peer Group contents for each circuit. Refer to the *Routing Protocols User's Guide* for more information about the Telesaving MIB and the monitoring tool.

14.3 Telesaving Configuration Examples

The following sections provide examples illustrating the use of call-blocking, call-back and initial minimum timer profiles. They assume that you have already set the system time, as described in Section 14.1.6.

14.3.1 Configuring a Call Bocking Profile

The following procedure describes how to configure a call-blocking profile to prevent incoming and outgoing calls outside normal working hours:

1. At the `Config>` prompt enter **feature tel** to display the `Profile Config>` prompt. For example:

```
Config>feature tel
Telesaving profiles configuration
Profile Config>
```

2. Use the **set blocking** command to enter the blocking profile dialog, and provide a name for the new profile. For example:

```
Profile Config>set blocking
SET profile - BLOCKING
Enter profile name (1 to 15 characters):        []? cblk01
```

3. Enter the default call-blocking actions. For example, to ensure that incoming and outgoing calls are blocked at all times, except during the timebands you will specify later, set the actions to **Both** and **Enable**:

```
Default Call-Blocking Action (None,Incoming,Outgoing,Both) :[NONE] ? both
Default Call-Blocking Clear Active Calls (Enable,Disable) :[DISABLE] ? e
```

Note: It is usually best to define weekend actions in the default action, or in the action for timeband 1.

4. Define each timeband where you want a different call-blocking action to override the default. For example, to allow incoming and outgoing calls during working hours from Monday to Friday, use these replies:

```
Band  1:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  1:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  1:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ?
Band  1:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ?
Band  1:  Call-Blocking Action (None,Incoming,Outgoing,Both) :  [NONE] ?
```

14.3 Telesaving Configuration Examples

5. Repeat the replies for each timeband that you want to specify. If you make a mistake, proceed to the next timeband and configure it correctly. You will have the opportunity later to delete unwanted timebands. You can define up to 5 separate timebands.

   If timebands overlap, the timeband with the highest number takes priority over the other timebands, so begin with wide timebands and then define specific timebands which override the wide timebands.

   For example, to allow incoming and outgoing calls during Saturday morning, and to block calls between midday and 1:00 pm use these replies:

```
Band  2:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? sa
Band  2:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ? sa
Band  2:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ?
Band  2:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 12:00
Band  2:  Call-Blocking Action (None,Incoming,Outgoing,Both) :  [NONE] ?
Band  3:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  3:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  3:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ? 12:00
Band  3:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 13:00
Band  3:  Call-Blocking Action (None,Incoming,Outgoing,Both) : [NONE] ?b
```

   Band 3 takes priority over Band 1, so in this example calls are allowed during the working day, but are blocked during the lunch break.

6. When you have entered all the timebands, reply **exit** to the next prompt, for example:

```
Band  4:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? exit
```

7. The command now asks if you want to delete any of the bands you just defined. If you answer Yes it will display a listing of the profile and ask for the band number to delete. For example, to delete the midday call-blocking band (Band 3) enter these replies:

```
Do you want to delete any bands ? (Yes or [No]): yes
========================================================================
Type                     Name                Default Blocking
----                     ----                ----------------
BLOCKING                 CBLK01              Action :- BOTH
                                             Clear Active Calls :- ENABLE

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     NONE
 2    SATURDAY   SATURDAY    08:30       12:00     NONE
 3    MONDAY     FRIDAY      12:00       13:00     BOTH
```

```
Enter band number to delete a band (1-5, all, none) [none] ? 3
========================================================================
Type                     Name                Default Blocking
----                     ----                ----------------
BLOCKING                 CBLK01              Action :- BOTH
                                             Clear Active Calls :- ENABLE

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     NONE
 2    SATURDAY   SATURDAY    08:30       12:00     NONE
```

8. When you have deleted all unwanted entries, confirm that you want this profile to be saved. For example:

```
Enter band number to delete a band (1-5, all, none) [none] ? none

Do you want to save profile CBLK01? Yes or [No]: yes
Profile config>
```

The call-blocking profile CBLK01 is now configured.

14.3.2 Configuring a Call-Back Profile

The following procedure describes how to configure a call-back profile to prevent call-back outside normal working hours or during a peak period:

1. At the `Config>` prompt enter **feature tel** to display the `Profile Config>` prompt. For example:

```
Config>feature tel
Telesaving profiles configuration
Profile Config>
```

2. Use the **set call-back** command to enter the call-back profile dialog, and provide a name for the new profile. For example:

```
Profile Config>set call
SET profile - CALL-BACK
Enter profile name (1 to 15 characters):        []? clb01
```

3. Enter the default values for the *call-back action*, *accept delay* and *request wait*. See Section 14.1.2.1 for more details about the accept delay and request wait timers.

14.3 Telesaving Configuration Examples

For example, to ensure that call-back is disabled at all times, except during the timebands you will specify later, you can set the default call-back action to **None** and use the standard defaults for the delay and wait timers:

```
Default Call-Back Action (None,Request,Accept) :  [NONE] ?
Accept delay milliseconds (100 to 5000) :  [1000]?
Request wait seconds (5 to 120) :  [20]?
```

4. Define each timeband where you want a different call-back action to override the default. For example, to allow call-back on incoming calls during the working day from Monday to Friday, use these replies:

```
Band  1:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  1:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  1:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ?
Band  1:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ?
Band  1:  Call-Back Action (None,Request,Accept) :  [NONE] ? a
```

5. Repeat the replies for each timeband that you want to specify. If you make a mistake, proceed to the next timeband and configure it correctly. You will have the opportunity later to delete unwanted timebands. A profile can contain up to 5 timebands.

   If timebands overlap, the timeband with the highest number takes priority over the other timebands, so begin with wide timebands and then define specific timebands which override the wide timebands.

   For example, to disable call-back during a peak period, say 10:00 to 14:30 you could use these replies:

```
Band  2:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  2:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  2:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ? 10:00
Band  2:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 15:00
Band  2:  Call-Back Action (None,Request,Accept) :  [NONE] ?
Band  3:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  3:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  3:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ? 10:00
Band  3:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 14:30
Band  3:  Call-Back Action (None,Request,Accept) :  [NONE] ?
```

Note: In this example the time was entered incorrectly for Band 2, so we went on to enter it correctly for Band 3.

6. When you have entered all the timebands, reply **exit** to the next prompt, for example:

```
Band  4:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? exit
```

7. The command now asks if you want to delete any of the bands you just defined. If you answer **Yes** it will display a listing of the profile and ask for the band number to delete. For example, to delete the mistake we made earlier (Band 2) enter these replies:

```
Do you want to delete any bands ? (Yes or [No]): y
========================================================================
Type                     Name               Default Call-Back
----                     ----               -----------------
CALL-BACK                CLB01              Action :- NONE
                                            Delay ms 1000
                                            Wait seconds 20

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     ACCEPT
 2    MONDAY     FRIDAY      10:00       15:00     NONE
 3    MONDAY     FRIDAY      10:00       14:30     NONE


Enter band number to delete a band (1-5, all, none) [none] ? 2
========================================================================
Type                     Name               Default Call-Back
----                     ----               -----------------
CALL-BACK                CLB01              Action :- NONE
                                            Delay ms 1000
                                            Wait seconds 20

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     ACCEPT
 2    MONDAY     FRIDAY      10:00       14:30     NONE
```

8. When you have deleted all the timebands you need to remove, reply **none** to the next prompt, for example:

```
Enter band number to delete a band (1-5, all, none) [none] ?
```

9. Now that you have deleted all unwanted entries, confirm that you want this profile to be saved. For example:

```
Do you want to save the profile CLB01 ? Yes or [No]: yes
Profile Config>
```

14.3.3 Configuring an Initial Minimum Timer Profile

The following procedure describes how to configure an Initial Minimum Timer profile to match the minimum call charges of the service provider.

1. At the `Config>` prompt enter **feature tel** to display the `Profile Config>` prompt. For example:

```
Config>feature tel
Telesaving profiles configuration
Profile Config>
```

2. Use the **set initial-minimum-timer** command to enter the initial minimum timer profile dialog, and provide a name for the new profile. For example:

```
Profile Config>set initial-minimum-timer
SET profile - INITIAL-MINIMUM-TIMER
Enter profile name (1 to 15 characters):        []? imt01
```

3. Enter the value for the default timer, in seconds. For example, if the weekend minimum call charge covers the cost of a two minute call, set the default timer to 120 seconds:

```
Default timer seconds (0-65535)            :  [30]? 120
```

Define each timeband where you want a different timer to override the default. Start with the widest timeband first. For example, if the minimum call charge covers 90 seconds outside working hours Monday to Friday, you can add another timeband to the profile:

```
Band  1:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  1:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  1:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ? 00:00
Band  1:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 24:00
Band  1:  timer seconds (0-65535)            :  [30]? 90
```

4. Repeat the process for each timeband that you want to specify, starting with the widest timebands and ending with the narrowest. If you make a mistake, proceed to the next timeband and configure it correctly. You will have the opportunity later to delete unwanted timebands. A profile can contain up to 5 timebands.

   For example, if the minimum call charge during normal working hours changes to cover only 1 minute, use these replies:

```
Band  2:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  2:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  2:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ? 08:00
Band  2:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 19:00
Band  2:  timer seconds (0-65535)             :  [30]? 60
```

5. When you have entered all the timebands, reply **exit** to the next prompt, for example:

```
Band  3:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? exit
```

6. The command now asks if you want to delete any of the bands you just defined. If you answer Yes it will display a listing of the profile and ask for the band number to delete:

```
Do you want to delete any bands ? (Yes or [No]): yes
========================================================================
Type                     Name                Default Timer(secs)
----                     ----                -------------------
INITIAL-MINIMUM-TIMER    IMT01               00120

Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      00:00       24:00     00090
 2    MONDAY     FRIDAY      08:00       19:00     00060

Enter band number to delete a band (1-5, all, none) [none] ?
```

7. When you have deleted all unwanted entries, confirm that you want this profile to be saved. For example:

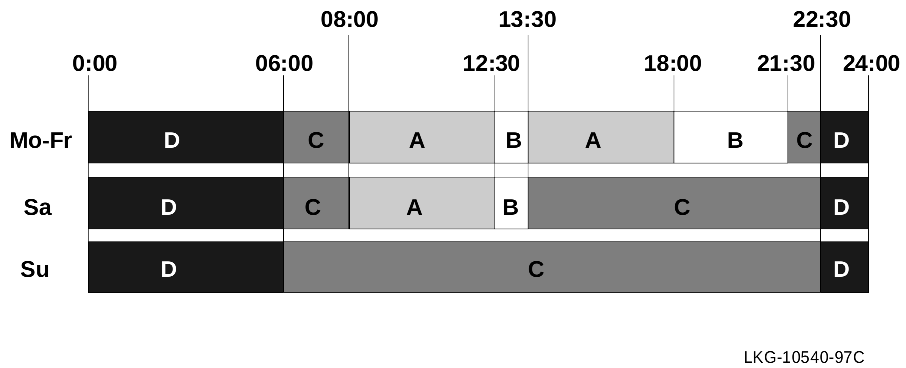
```
Do you want to save the profile IMT01 ? Yes or [No]: yes
```

14.3 Telesaving Configuration Examples

14.3.4 Configuring an IMT Profile to Match a National Tariff Structure

To demonstrate how to configure and use Initial Minimum Time profiles to suit a particular country’s tariff structure, consider the tariff structure for country X. At the time of publication, their ISDN service is offering four different tariff rates (Tariff codes A, B, C and D) which operate at different times of the the week, as shown in Figure 14–2.

Figure 14–2 Tariff Rates by Time of Week



The initial minimum call charge is fixed at $0.73 (including tax) at all times. However, the tariff rate varies depending on the distance of the call and the time of week. As a result this initial minimum call charge covers a different number of seconds, depending on the actual rate applied to the current call.

Table 14–1 shows the number of seconds that the initial minimum call charge buys at the local rate (in local and neighboring town) at each of the four tariff codes (Tariff Codes A, B, C and D).

Table 14–1 Local Tariff Structure

Tariff Code	Local and Neighbouring Town (seconds)
A	180
B	270
C	360
D	540

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You can configure an Initial Minimum Call Timer profile for the local area. Use the **set initial-minimum-timer** command to create an IMT profile, defining timebands which match the charges illustrated in Figure 14–2 and using the number of seconds for each tariff code given in Table 14–1:

- Set the **default** tariff to value of Tariff Code D (540 seconds).
- Define five timebands using the values given in Table 14–2, setting the timer to the appropriate number of seconds for the Tariff Code letter.

Table 14–2 Example Initial Minimum Call Timer Profile Structure

Time Band	First Day	Last Day	Start Time	End Time	Tariff Code	Timer (seconds)
1	Monday	Sunday	06:00	22:30	C	360
2	Monday	Saturday	08:00	12:30	A	180
3	Monday	Friday	13:30	18:00	A	180
4	Monday	Saturday	12:30	13:30	B	270
5	Monday	Friday	18:00	21:30	B	270

When you have configured the local IMT profile it will have a default rate specified by Tariff D (540 seconds). Time band 1 overrides this with Tariff C (360 seconds) between 06:00 and 22:30, every day of the week. timebands 2 through 5 do not overlap each other, but they override Tariff C with Tariffs A (180 seconds) and B (270 seconds) whenever they are active.

The profile we have just created is suitable for use by Dial Circuits making local calls only. The ISDN service provider has six different charge bands, depending on the distance of the call. Table 14–3 shows the number of seconds that the initial minimum call charge buys in each of these distance ranges at each of the four tariff rates (Tariff Codes A, B, C and D).

14.3 Telesaving Configuration Examples

Table 14–3 Number of Seconds Covered by Initial Minimum Call Charge

Tariff Code	Local and Neighbouring Town	Up to 25 km	25 km to 30 km	30 km to 52 km	52 km to 100 km	Over 100 km
A	180	120	72	45	24	19
B	270	170	102	64	34	27
C	360	240	144	90	48	38
D	540	340	204	128	68	54

You must now configure a profile for each of the long distance charge bands in turn, following the same procedure we used for the local area. When this is complete there will be six IMT profiles available for use.

You must now determine the charge band (column) which applies to the **destination** address for each Dial Circuit on your router. You can then configure each Dial Circuit to use the IMT profile which is appropriate for the distance of the remote station.

14.3.5 Configuring a Dial Circuit to Use Telesaving Profiles

By default, Dial Circuits will use the profile called **DEFAULT**, for each of the three telesaving profiles. The following procedure describes how to configure a Dial Circuit to use the profiles we have just defined instead of the default profile:

1. Use the **set initial-minimum-timer** command to configure the Dial Circuit to use the named profile. For example:

   ```
   Circuit config>set initial-minimum-timer imt01
   ```

2. At the `Circuit config>` prompt use the **set blocking** command to configure the Dial Circuit to use the named profile. For example:

   ```
   Circuit config>set blocking cblk01
   ```

3. Use the **set call-back** command to configure the Dial Circuit to use the named profile. For example:

   ```
   Circuit config>set call-back clb01
   ```

4. Use the **list** command to verify the Dial Circuit configuration. For example:

```
Circuit config>list
Base net:       2
Destination name:    worcester
Inbound dst name:    worcester
Outbound calls       allowed
Inbound calls        allowed
Idle timer           = 90 sec
SelfTest Delay Timer = 300 ms
Send Line ID:        NO
Profile(s) configured:
    type: Initial Minimum Timer  name: IMT01
    type: Call Blocking  name: CBLK01
    type: Call-Back   name: CLB01
```

Refer to Chapter 2 for more information about configuring Dial Circuits.

14.4 Configuring a Central Site to Control Telesaving

If you are configuring a network where you want a central station to take the lead in managing the Telesaving features, then you must configure each of the remote stations to abdicate responsibility for each of the Telesaving components.

14.4.1 Central Control of Initial Minimum Timer

The default value of the Dial Circuit Idle timer is 60 seconds, and the IMT default is 30 seconds. This effectively cancels the IMT, but the Idle timer may interfere with the central site's telesaving profiles. If you set the Idle timer to its maximum value (65,535) at each of the remote stations, then the central site will be able to control the calls.

14.4.2 Central Control of Call-Blocking and Budgets

Call-blocking and budget controls are disabled by default, so that remote sites can be controlled centrally.

14.4.3 Central Control of Call-Back

Setting the remote stations to request call-back allows the central station to determine whether call-back is used or not. If the central station is set to accept call-back then call-back will operate. If the central station is set to None or Request, then the incoming calls are just accepted.

14.5 Telesaving Configuration Commands

This section summarizes and explains the TEL configuration commands.

The TEL configuration commands allow you to configure telesaving profiles. Enter the TEL configuration commands at the `Profile config>` prompt.

Table 14–4 lists the TEL configuration commands.

Table 14–4 Telesaving Configuration Commands Summary

Command	Function
? (Help)	Lists all the telesaving configuration commands or lists the options associated with specific commands.
Delete	Removes a profile.
List	Displays the current telesaving profiles.
Set	Creates or modifies an existing telesaving profile.
Exit	Exits the telesaving configuration process and returns to the CONFIG environment.

? (Help) C

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:

```
?
DELETE
EXIT
LIST
SET
```

Delete C

Deletes a specified profile.

Syntax: delete

blocking
call-back
initial-minimum-timer

blocking

Removes a call-blocking profile. You must supply the name of the profile to be deleted. The profile you specify is displayed and you must confirm that it is the profile you want to delete.

The fields which are displayed are described under the **list blocking** command.

Example:

```
delete blocking
DELETE profile -  BLOCKING
Enter profile name (1 to 15 characters):        []? cblk01
========================================================================
Type                     Name               Default Blocking
----                     ----               ----------------
BLOCKING                 CBLK01             Action :- BOTH
                                            Clear Active Calls :- ENABLE

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     NONE
 2    SATURDAY   SATURDAY    08:30       12:00     NONE

Are you sure you want to DELETE this profile? (Yes or [No]): y
```

call-back

Removes a call-back profile. You must supply the name of the profile to be deleted. The profile you specify is displayed and you must confirm that it is the profile you want to delete.

The fields which are displayed are described under the **list call-back** command.

14.5 Telesaving Configuration Commands

Example:

```
delete call-back
DELETE profile -  CALL-BACK
Enter profile name (1 to 15 characters):        []? clb01
========================================================================
Type                     Name                Default Call-Back
----                     ----                -----------------
CALL-BACK                CLB01               Action :- NONE
                                             Delay ms 1000
                                             Wait seconds 20

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     ACCEPT
 2    SATURDAY   SATURDAY    08:30       12:00     ACCEPT

Are you sure you want to DELETE this profile? (Yes or [No]):y
```

initial-minimum-timer

Removes an initial minimum timer profile. You must supply the name of the profile to be deleted. The profile you specify is displayed and you must confirm that it is the profile you want to delete.

The fields which are displayed are described under the **list initial-minimum-timer** command.

Example:

```
delete initial-minimum-timer
DELETE profile -  INITIAL-MINIMUM-TIMER
Enter profile name (1 to 15 characters):        []? imt01
========================================================================
Type                     Name                Default Timer(secs)
----                     ----                -------------------
INITIAL-MINIMUM-TIMER    IMT01               00120

Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:00       19:00     00060
 2    SATURDAY   SATURDAY    00:00       24:00     00090

Are you sure you want to DELETE this profile? (Yes or [No]): yes
```

List C

Display the current configuration of telesaving profiles.

Syntax: list

blocking
call-back
initial-minimum-timer

blocking

Displays call-blocking profiles, showing when incoming or outgoing calls will be permitted and when they will be blocked.

Example:

```
list blocking
LIST profile(s) - BLOCKING                    * = current active action
Enter profile name, or ALL (1 to 15 characters):   []? all
========================================================================
Type                     Name              Default Blocking
----                     ----              ----------------
BLOCKING                 DEFAULT          *Action :- NONE
                                           Clear Active Calls :- DISABLE


No bands defined

========================================================================
Type                     Name                Default Blocking
----                     ----                ----------------
BLOCKING                 CBLK01              Action :- BOTH
                                             Clear Active Calls :- ENABLE

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     NONE
 2    SATURDAY   SATURDAY    08:30       12:00     NONE


*** End of profile listing ***
```

List profile(s)	BLOCKING. This is a call-blocking profile.
Enter profile name	Specify the name of the call-blocking profile you want to list, or **ALL** to display all call-blocking profiles.

14.5 Telesaving Configuration Commands

Type — Indicates the type of profile being displayed. BLOCKING indicates that this is a call-blocking profile.

Name — Indicates the name used to identify this profile. The name has 1 to 15 characters.

Default Blocking

Action — The default call-blocking action which is used if none of the configured bands apply:

- **None –** Allow incoming and outgoing calls.
- **Incoming –** Do not accept incoming calls.
- **Outgoing –** Do not allow outgoing calls.
- **Both** – Do not allow incoming or outgoing calls.

The asterisk (*) indicates that this is the currently active action.

Clear Active Calls — Indicates whether active calls will be cleared when this band becomes active:

- **Enable** – Active calls, in the direction specified by *Action,* will be cleared when this band becomes active.
- **Disable –** Active calls will not be cleared when this band becomes active.

Band — Indicates the sequence number of the timeband defined within each profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number.

The asterisk (*) indicates that this is the currently active band.

Start Day — Indicates the day of the week on which this timeband begins.

End Day — Indicates the day of the week on which this timeband ends.

Start Time — Indicates the time of day at which this timeband begins each day. The format is *hh:mm,* where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.

End Time Indicates the time of day at which this timeband ends each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.

Action Indicates the call-blocking action which is used when this timeband is active:

None – Allow incoming and outgoing calls.

Incoming – Do not accept incoming calls.

Outgoing – Do not allow outgoing calls.

Both – Do not allow incoming or outgoing calls.

call-back

Displays the call-back profiles, showing when outgoing calls will request call-back, or when incoming calls will be accepted using call-back, and when call-back will not be available.

Example:

```
list call-back
LIST profile(s) - CALL-BACK                    * = current active action
Enter profile name, or ALL (1 to 15 characters):   []? clb01
========================================================================
Type                     Name                Default Call-Back
----                     ----                -----------------
CALL-BACK                CLB01               Action :- NONE
                                             Delay ms 1000
                                             Wait seconds 20

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     ACCEPT
 2    SATURDAY   SATURDAY    08:30       12:00     ACCEPT


*** End of profile listing ***
```

List profile(s) CALL-BACK. This is a call-back telesaving profile.

Enter profile name Specify the name of the call-back profile you want to list, or **ALL** to display all call-back profiles.

14.5 Telesaving Configuration Commands

Type — Indicates the type of profile being displayed. CALL-BACK indicates that this is a call-back profile.

Name — Indicates the name used to identify this profile. The name has 1 to 15 characters.

Default Call-Back

Action — The default call-back action which is used if none of the configured bands apply:

- **None –** Do not use call-back.
- **Accept –** Call back to the remote station when monitoring incoming calls.
- **Request** – Request call-back from remote station on outgoing calls.

The asterisk (*) indicates that this is the currently active action.

Accept Delay — Indicates the the default interval, in milliseconds, that the acceptor waits before redialing when calling back to the remote station.

The range is 100 to 5000 milliseconds, and the default value is 1000 milliseconds.

Wait — Indicates the default interval, in seconds, that the Receiver waits for a remote station to respond to an outgoing call which requests call-back.

The range is 5 to 120 seconds and the default value is 20 seconds.

Band — Indicates the sequence number of the timeband defined within each profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number.

The asterisk (*) indicates that this is the currently active band.

Start Day — Indicates the day of the week on which this timeband begins.

End Day — Indicates the day of the week on which this timeband ends.

Start Time	Indicates the time of day at which this timeband begins each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.
End Time	Indicates the time of day at which this timeband ends each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.
Action	Indicates the call-back action which is used when this timeband is active: **None –** Do not use call-back. **Accept** – Call back to the remote station when accepting incoming calls. **Request** – Request call-back from remote station on outgoing calls.

initial-minimum-timer

Displays the initial minimum timer profiles, showing the initial minimum timer values configured for different times of the day or week.

Example:

```
list initial-minimum-timer
LIST profile(s)-INITIAL-MINIMUM-TIMER     * = current active timer
Enter profile name, or ALL (1 to 15 characters):   []? all
=======================================================================
Type                      Name                Default Timer(secs)
----                      ----                -------------------
INITIAL-MINIMUM-TIMER     DEFAULT             00090

Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
 1    MONDAY     FRIDAY      00:00       24:00     00050
*2    MONDAY     FRIDAY      08:00       18:00     00030
========================================================================
Type                      Name                Default Timer(secs)
----                      ----                -------------------
INITIAL-MINIMUM-TIMER     IMT01               00120

Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      00:00       24:00     00090
 2    MONDAY     FRIDAY      08:00       19:00     00060

*** End of profile listing ***
```

14.5 Telesaving Configuration Commands

List profile(s)	INITIAL-MINIMUM-TIMER. This is an initial minimum timer profile.
Enter profile name	Specify the name of the initial minimum timer profile you want to list, or **ALL** to display all initial minimum timer profiles.
Type	Indicates the type of profile being displayed. INITIAL-MINIMUM-TIMER indicates that this is an initial minimum timer profile.
Name	Indicates the name used to identify this profile. The name has 1 to 15 characters.
Default Timer	Indicates the default minimum time, in seconds, that calls will be connected. This timer is used when no other timeband in the profile is active.
Band	Indicates the sequence number of each timeband in the profile. If timebands overlap, then the band with the highest sequence number takes priority over those with a lower number. The asterisk (*) indicates that this is the currently active band.
Start Day	Indicates the day of the week on which this timeband begins.
End Day	Indicates the day of the week on which this timeband ends.
Start Time	Indicates the time of day at which this timeband begins each day. The format is *hh:mm,* where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.
End Time	Indicates the time of day at which this timeband ends each day. The format is *hh:mm,* where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.
Timer	Indicates the minimum time, in seconds, that calls will be connected when this timeband is active.

14.5 Telesaving Configuration Commands

Set C

Create or modify a profile.

Note: If the time of week has not been set or resolved, then all profiles will use the DEFAULT action settings at all times. See Section 14.1.6 for more information about setting the system date and time.

Syntax: set

blocking
call-back
initial-minimum-timer

blocking

Use the **set blocking** command to define the periods during which incoming or outgoing calls will be blocked.

The command prompts for the default action and the time span and call-blocking action for a series of up to 5 timebands. The higher number bands take priority over the lower bands, so you should configure the wider timebands first, and override periods later.

When you have configured all the timebands, the command allows you to delete any bands which you have configured in error and finally asks for confirmation before saving the new profile. You must restart the router for the changes to take effect.

Example:

```
set blocking
SET profile - BLOCKING
Enter profile name (1 to 15 characters):[]? cblk01
Default Call-Blocking Action (None,Incoming,Outgoing,Both) :[NONE]? both
Default Call-Blocking Clear Active Calls(Enable,Disable):[DISABLE]? e
Band  1:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  1:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  1:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ?
Band  1:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ?
Band  1:  Call-Blocking Action (None,Incoming,Outgoing,Both) :  [NONE] ?
Band  2:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? sa
Band  2:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ? sa
Band  2:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ?
Band  2:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 12:00
Band  2:  Call-Blocking Action (None,Incoming,Outgoing,Both) :  [NONE] ?
Band  3:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  3:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  3:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ? 12:00
Band  3:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 13:00
```

```
Band  3:  Call-Blocking Action (None,Incoming,Outgoing,Both) :  [NONE] ?
both
Band  4:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? exit

Do you want to delete any bands ? (Yes or [No]): y
========================================================================
Type                     Name                Default Blocking
----                     ----                ----------------
BLOCKING                 CBLK01              Action :- BOTH
                                             Clear Active Calls :- ENABLE

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     NONE
 2    SATURDAY   SATURDAY    08:30       12:00     NONE
 3    MONDAY     FRIDAY      12:00       13:00     BOTH

Enter band number to delete a band (1-5, all, none) [none] ? 3
========================================================================
Type                     Name                Default Blocking
----                     ----                ----------------
BLOCKING                 CBLK01              Action :- BOTH
                                             Clear Active Calls :- ENABLE

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     NONE
 2    SATURDAY   SATURDAY    08:30       12:00     NONE

Enter band number to delete a band (1-5, all, none) [none] ?

Do you want to save profile CBLK01? Yes or [No]: yes
```

SET profile
BLOCKING. This indicates that you are configuring a call-blocking profile.

Enter profile name
Specify the name of the blocking profile you want to create or modify. The name can have 1 to 15 characters.

If you enter the name of an existing profile its configuration will be displayed as shown by the **list blocking** command. The prompts which follow will then use the existing values for each field.

Default Call-Blocking Action	The default call-blocking action to be used if none of the configured bands apply: **None –** Allow incoming and outgoing calls. **Incoming** – Do not accept incoming calls. **Outgoing** – Do not allow outgoing calls. **Both** – Do not allow incoming or outgoing calls.
Default Call-Blocking Clear Active Calls	Set active calls to be cleared when a new band becomes active: **Enable** – When a new band which disables calls becomes active, and active calls in that direction will be cleared. For example, if the new band blocks incoming calls, all active incoming calls will be cleared. **Disable –** Active calls will not be cleared when a new band becomes active.
Band n:	Indicates the sequence number of the timeband you are defining. A profile can contain up to 5 timebands. A time band is active from *Start Time* to *End Time*, each day in the range *Start Day* to *End Day.*
Start day	Set the day of the week on which this timeband begins. Valid values are: **SU** – Sunday **M** – Monday **TU** – Tuesday **W** – Wednesday **TH** – Thursday **F** – Friday **SA** – Saturday **EXIT** – all bands have been configured, exit from band definition stage
End day	Set the day of the week on which this timeband ends. Values are as for *Start day* except there is no **Exit** option.
Start Time	Set the time of day at which this timeband begins each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.

End Time	Set the time of day at which this timeband ends each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.
Call-Blocking Action	Set the call-blocking action which is used when this timeband is active: **None –** Allow incoming and outgoing calls. **Incoming** – Do not accept incoming calls. **Outgoing** – Do not allow outgoing calls. **Both** – Do not allow incoming or outgoing calls.
Do you want to delete any bands	Enter **Yes** if you want to delete any of the bands in the profile. Enter **No** to accept the defined bands. If you enter **Yes**, the profile is displayed as if you had used the **list blocking** command.
Enter band number to delete a band	Enter the number of the band which you want to delete. The profile is redisplayed with the specified band deleted. This question is repeated until you enter **none** to indicate that you do not want to delete any more bands.
Do you want to save profile XXX ?	Enter **Yes** if you want to save the profile, or **No** if you want to abandon the changes.

call-back

Use the **set call-back** command to specify the options for actions to be taken if call-back is being used. You may want to implement call-back to provide a level of call security, but it can also be used to centralize call charging, particularly if calls are cheaper in one direction than another.

Example:

```
set call-back
SET profile - CALL-BACK
Enter profile name (1 to 15 characters):        []? clb01
Default Call-Back Action (None,Request,Accept) :  [NONE] ?
Accept delay milliseconds (100 to 5000) :  [1000]?
Request wait seconds (5 to 120) :  [20]?
Band  1:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  1:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  1:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ?
Band  1:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ?
```

```
Band  1:  Call-Back Action (None,Request,Accept) :  [NONE] ? a
Band  2:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? sa
Band  2:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ? sa
Band  2:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ?
Band  2:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 12:00
Band  2:  Call-Back Action (None,Request,Accept) :  [NONE] ? a
Band  3:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? exit

Do you want to delete any bands ? (Yes or [No]): yes
========================================================================
Type                    Name               Default Call-Back
----                    ----               -----------------
CALL-BACK               CLB01              Action :- NONE
                                           Delay ms 1000
                                           Wait seconds 20

Band  Start Day  End Day     Start Time  End Time  Action
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:30       18:30     ACCEPT
 2    SATURDAY   SATURDAY    08:30       12:00     ACCEPT

Enter band number to delete a band (1-5, all, none) [none] ?

Do you want to save profile CLB01? Yes or [No]: yes
```

SET profile

CALL-BACK. This indicates that you are configuring a call-back telesaving profile.

Enter profile name

Specify the name of the call-back profile you want to create or modify. The name can have 1 to 15 characters.

If you enter the name of an existing profile its configuration will be displayed as shown by the **list call-back** command. The prompts which follow will then use the existing values for each field.

Default Call-Back Action

Set the default call-back action which is used if none of the configured bands apply:

None – Do not use call-back.

Accept – Call back to the remote station when accepting incoming calls.

Request – Request call-back from remote station on outgoing calls.

14.5 Telesaving Configuration Commands

Accept Delay	Set the **Acceptor's** default call turnaround interval, in milliseconds. When an **Acceptor** receives and accepts a call-back request this is the interval it waits between clearing the call and sending a call-request back in response. The range is 100 to 5000 milliseconds, and the default value is 1000 milliseconds.
Request Wait	Set the default interval, in seconds, for the **Requestor** to wait before re-issuing an outgoing call-back request. The **Acceptor** also uses this timer. If the response call to a call-back request fails, a timer is started with a value of 50% of this *Request Wait* time and on expiry, the call-back response call is retried. Providing that the *Request Wait* timer at **both** stations is the same, the second response call should be received before the **Requestor's** timer expires. The range is 5 to 120 seconds and the default value is 20 seconds. **Note:** See Section 14.1.2.1 for more details about the *Accept Delay* and *Request Wait* timers.
Band n:	Indicates the sequence number of the timeband you are defining. A profile can contain up to 5 timebands. A time band is active from *Start Time* to *End Time*, each day in the range *Start Day* to *End Day.*
Start day	Set the day of the week on which this timeband begins. Valid values are: **SU** – Sunday **M** – Monday **TU** – Tuesday **W** – Wednesday **TH** – Thursday **F** – Friday **SA** – Saturday **EXIT –** all bands have been configured, exit from band definition stage
End day	Set the day of the week on which this timeband ends. Values are as for *Start day* except there is no **Exit** option.

Start Time	Set the time of day at which this timeband begins each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.
End Time	Set the time of day at which this timeband ends each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.
Call-Back Action	Set the call-back action which is used when this timeband is active: **None –** Do not use call-back. **Accept** – Call back to the remote station when accepting incoming calls. **Request** – Request call-back from remote station on outgoing calls.
Do you want to delete any bands	Enter **Yes** if you want to delete any of the bands in the profile. Enter **No** to accept the defined bands. If you enter **Yes**, the profile is displayed as if you had used the **list call-back** command.
Enter band number to delete a band	Enter the number of the band which you want to delete. The profile is redisplayed with the specified band deleted. This question is repeated until you enter **none** to indicate that you do not want to delete any more bands.
Do you want to save profile XXX?	Enter **Yes** if you want to save the profile, or **No** if you want to abandon the changes.

initial-minimum-timer

Use the **set initial-minimum-timer** command to specify how long a Dial Circuit must stay connected.

For example, if the service provider has a minimum call charge of two minutes, and your system connects and clears a Dial Circuit six times in 2 minutes, with each call lasting about 15 seconds, you would be charged for 12 minutes line usage in the 2 elapsed minutes! Setting the **initial-minimum-timer** value to 120 seconds ensures that the Dial Circuit remains connected. In this example, all six calls could be made with the Dial Circuit connected just once, so you would only be charged once for the 2 minutes of line usage.

14.5 Telesaving Configuration Commands

If the minimum call charge varies at different times of the day or week you can configure the initial minimum timer profile to match these changes.

Example:

```
set initial-minimum-timer
SET profile – INITIAL-MINIMUM-TIMER
Enter profile name (1 to 15 characters):        []? imt01
Default timer seconds (0-65535)              :  [30]? 120
Band  1:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ?
Band  1:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ?
Band  1:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ? 08:00
Band  1:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 19:00
Band  1:  timer seconds (0-65535)            :  [30]? 60
Band  2:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? sa
Band  2:  End day   (M,TU,W,TH,F,SA,SU)         :  [FRIDAY   ] ? sa
Band  2:  Start time: Hour (0-23) Minute (:00,:30) [08:30] ? 00:00
Band  2:  End time:   Hour (0-24) Minute (:00,:30) [18:30] ? 24:00
Band  2:  timer seconds (0-65535)            :  [30]? 90
Band  3:  Start day (M,TU,W,TH,F,SA,SU,EXIT)    :  [MONDAY   ] ? exit

Do you want to delete any bands ? (Yes or [No]): yes
========================================================================
Type                     Name                Default Timer(secs)
----                     ----                -------------------
INITIAL-MINIMUM-TIMER    IMT01               00120

Band  Start Day  End Day     Start Time  End Time  Timer(secs)
----  ---------  -------     ----------  --------  ------
*1    MONDAY     FRIDAY      08:00       19:00     00060
 2    SATURDAY   SATURDAY    00:00       24:00     00090

Enter band number to delete a band (1-5, all, none) [none] ?

Do you want to save profile IMT01 ? Yes or [No]: yes
```

SET profile — INITIAL-MINIMUM-TIMER. This indicates that you are configuring an initial minimum call timer profile.

Enter profile name — Specify the name of the initial minimum call timer profile you want to create or modify. The name can have 1 to 15 characters.

If you enter the name of an existing profile its configuration will be displayed as shown by the **list initial-minimum-timer** command. The prompts which follow will then use the existing values for each field.

Default Timer	Set the default timer which is used if none of the configured bands apply.
Band n:	Indicates the sequence number of the timeband you are defining. A profile can contain up to 5 timebands. A time band is active from *Start Time* to *End Time*, each day in the range *Start Day* to *End Day.*
Start day	Set the day of the week on which this timeband begins. Valid values are: **SU** – Sunday **M** – Monday **TU** – Tuesday **W** – Wednesday **TH** – Thursday **F** – Friday **SA** – Saturday **EXIT** – all bands have been configured, exit from band definition stage
End day	Set the day of the week on which this timeband ends. Values are as for *Start day* except there is no **Exit** option.
Start Time	Set the time of day at which this timeband begins each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 23, and *mm* represents minutes and is either 00 or 30.
End Time	Set the time of day at which this timeband ends each day. The format is *hh:mm*, where *hh* represents the hour, in the range 00 to 24, and *mm* represents minutes and is either 00 or 30.
Timer	Set the initial minimum timer, in seconds, for this timeband in the range 1 to 65535. The default value is 30 seconds.
Do you want to delete any bands	Enter **Yes** if you want to delete any of the bands in the profile. Enter **No** to accept the defined bands. If you enter **Yes**, the profile is displayed as if you had used the **list initial-minimum-timer** command.

Enter band number to delete a band	Enter the number of the band which you want to delete. The profile is redisplayed with the specified band deleted. This question is repeated until you enter **none** to indicate that you do not want to delete any more bands.
Do you want to save profile XXX?	Enter **Yes** if you want to save the profile, or **No** if you want to abandon the changes.

Exit C

Return to the `Config>` prompt.

Syntax: exit

Example:

```
exit
```

15

Configuring and Monitoring the WAN Restoral Feature

This chapter describes how to configure and monitor the WAN Restoral feature for WAN Restoral or for WAN Reroute.

15.1 Accessing the Feature Configuration and Console Processes

You configure WAN Restoral using the WRS feature.

To access the WRS feature configuration environment, use the **feature wrs** command at the `Config>` prompt.

Example:

```
Config>feature wrs
WAN Restoral user configuration
WRS Config>
```

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

Enter configuration commands at the `WRS Config>` prompt.

To access the WAN Restoral console environment, use the **feature wrs** command at the `GWCON (+)` prompt.

Example:

```
+ feature wrs
WAN Restoral user console
WRS>
```

Enter console (monitoring) commands at the `WRS>` prompt.

15.2 WAN Restoral or WAN Reroute

You can configure a Dial Circuit to back up for a *primary* serial interface. The back up circuit may either dial in to the same remote router that the primary circuit connects to, or it may connect to a third router.

You should use WAN Restoral and configure the back up circuit as a *secondary* interface, if:

- The back up Dial Circuit connects to the same router as the primary circuit, and
- The datalink protocol for the primary circuit and the back up circuit are both PPP, or both PSL.

If the back up Dial Circuit connects to a third router, or if the primary circuit is using PPP over Frame Relay (PPP-FR pseudo interface) then you must use WAN Reroute and configure the back up circuit as an *alternate* interface.

15.3 Configuring for WAN Restoral

15.3.1 Before You Begin

Before you can use WAN Restoral you must have the following connections between two routers:

- A leased line connection configured as the primary serial interface on both routers. The primary interface must be running either PPP or PSL.
- A dial-up connection with Dial Circuits configured as the secondary interface on both routers. The Dial Circuits may be V.25 *bis* or ISDN circuits.

The routers must be configured with:

- The idle timer on the secondary Dial Circuits 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 send calls only. Use the **set calls outbound** command at the `Circuit Config>` prompt.
- The secondary Dial Circuit at the other end of the link configured to receive calls only. Use the **set calls inbound** command at the `Circuit Config>` prompt.

This ensures that when the primary interface goes down, one router will call the other over the secondary circuit to re-establish the connection. Routing is not involved in the change since the back-up link connects the same routers as the primary link.

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.

15.3.2 Datalink Layer Configuration

The primary and secondary links must be configured for the same datalink layer protocol, either PPP or PSL. The default is PPP. 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, ISDN or V.25 *bis* see the appropriate chapters in this guide.

15.3.3 WAN Restoral Configuration Procedure

This section describes the steps required to configure WAN Restoral. It assumes that you have two routers connected by a serial leased line (the primary interface) with a back up connection over a Dial Circuit (the secondary interface).

Before you begin, enter **list device** at the `Config>` prompt to list the interface numbers of all the different devices.

The following steps assume that interface 1 has already been configured as the primary interface using PPP. The steps you should follow depend on whether the secondary circuit is an ISDN link or a V.25 *bis* link.

15.3.3.1 Setting Up a V.25 *bis* Dial Circuit as a Secondary Circuit

Follow these steps on the routers at each end of the link to configure the V.25 *bis* Dial Circuit as the secondary circuit:

1. Set the datalink of the serial interface to V.25 *bis*. For example, to set interface 2 to V.25 *bis* enter the following:

```
Config>set data v25bis 2
Config>
```

15.3 Configuring for WAN Restoral

2. Enable the interface.

```
Config>enable interface 2
Config>
```

3. Add a Dial Circuit (for example on interface 3). The protocol will be PPP by default.

```
Config>add device dial-circuit
Config>
```

4. Enable the new Dial Circuit interface.

```
Config>enable interface 3
Config>
```

5. Add a V.25 *bis* network address, entering the name and phone number at the prompts for both local and remote routers.

```
Config>add v25-bis-address locaddrname locdialaddr
Config>add v25-bis-address remaddrname remdialaddr
Config>
```

6. Configure the V.25 *bis* serial line (in this example network 2). At the `Config>` prompt enter **network 2** to display the `V.25bis Config>` prompt.

```
Config>network 2
V.25bis Configuration
V.25bis Config>
```

7. Set the local address to the network address name of the local port (this must match the **local** name you specified at the `Config>` prompt).

```
V.25bis Config>set local-address locaddrname
V.25bis Config>
```

8. Return to the `Config>` prompt.

```
V.25bis Config>exit
Config>
```

9. At the `Config>` prompt enter **network 3** to display the `Circuit Config>` prompt so you can configure the Dial Circuit (network 3 in our example).

```
Config>network 3
Circuit configuration
Circuit Config>
```

10. At the `Circuit Config>` prompt map the Dial Circuit (network 3) to the V.25 *bis* circuit (network 2).

```
Circuit Config>set network 2
Circuit Config>
```

11. At the `Circuit Config>` prompt set the idle timer to 0.

```
Circuit Config>set idle 0
Circuit Config>
```

12. At the `Circuit Config>` prompt, set the call direction. You must set calls **inbound** at one end of the secondary link, and **outbound** at the other end.

```
Circuit Config>set calls direction
Circuit Config>
```

13. On the **inbound** router, you must allow incoming calls from the remote destination. Use the set inbound command and specify either the **remote** name you specified at the `Config>` prompt, or **any** to accept all incoming calls.

```
Circuit Config>set inbound remote-destination
Circuit Config>
```

14. On the **outbound** router define the number to call. Set the destination address of the remote router (this must match the **remote** name you specified at the `Config>` prompt).

15. Set the destination address of the remote router (this must match the **remote** name you specified at the `Config>` prompt).

```
Circuit Config>set destination remaddrname
Circuit Config>
```

16. Return to the `Config>` prompt.

```
Circuit Config>exit
Config>
```

15.3.3.2 Setting Up an ISDN Dial Circuit as a Secondary Circuit

Follow these steps on the routers at each end of the link to configure an ISDN Dial Circuit as a secondary circuit:

1. If the protocol on the Primary circuit is PPP, set the buffer size (maximum receive unit size) to 1800.

```
Config>network 1
PPP Config>set lcp opt
Maximum Receive Unit (bytes) [2048]? 1800
Authentication Protocol (None, Pap, Chap, Either) [none]:
PPP Config>exit
```

2. Ensure that the ISDN interface is enabled. For example enter the following command:

```
Config>enable interface 2
Config>
```

3. Add a Dial Circuit (for example on interface 3). The protocol will be PPP by default.

```
Config>add device dial-circuit
Config>
```

4. Enable the new Dial Circuit interface.

```
Config>enable interface 3
Config>
```

5. Configure the ISDN interface with the network address names, address ISDN dial numbers and subdial addresses for the local reouter and the remote router.

```
Config>add isdn
Assign address name [1-23] chars  []? local-name
Assign network dial address [1-15 digits] []? local-address
Assign network subdial address [0-20 digits]  []? local-subdial
Config>add isdn
Assign address name [1-23] chars  []? remote-name
Assign network dial address [1-15 digits] []? remote-address
Assign network subdial address [0-20 digits]  []? remote-subdial
Config>
```

6. Configure the ISDN serial line (in this example network 2). At the `Config>` prompt enter **network 2** to display the `ISDN Config>` prompt.

```
Config>network 2
ISDN Configuration
ISDN Config>
```

7. Set the local address to the network address name of the local port (this must match the **local name** you specified in step 5.

```
ISDN Config>set local-address local-name
ISDN Config>
```

8. Return to the `Config>` prompt.

```
ISDN Config>exit
Config>
```

9. At the `Config>` prompt, enter **network 3** to display the `Circuit Config>` prompt so you can configure the Dial Circuit (network 3 in our example).

```
Config>network 3
Circuit configuration
Circuit Config>
```

10. At the `Circuit Config>` prompt, map the Dial Circuit (network 3) to the ISDN circuit (network 2).

```
Circuit Config>set network 2
Circuit Config>
```

11. At the `Circuit Config>` prompt, set the idle timer to 0.

```
Circuit Config>set idle 0
Circuit Config>
```

12. At the `Circuit Config>` prompt, set the call direction. You must set calls **inbound** at one end of the secondary link, and **outbound** at the other end.

```
Circuit Config>set calls direction
Circuit Config>
```

13. On the **inbound** router, you must allow incoming calls from the remote destination. Use the set inbound command and specify the **local name** you specified in step 5. Alternatively, you can specify **any** to accept all incoming calls.

```
Circuit Config>set inbound local-name
Circuit Config>
```

14. On the **outbound** router, define the number to call. Set the destination address of the remote router. This must match the **remote name** you specified in step 5.

```
Circuit Config>set destination remote-name
Circuit Config>
```

15. Return to the `Config>` prompt.

```
Circuit Config>exit
Config>
```

15.3.3.3 Setting Up the WAN Restoral Feature

When you have configured the Dial Circuits you use the WAN Restoral feature to configure and enable WAN Restoral on each router. Follow these steps on the routers at each end of the link to configure the WAN Restoral:

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. In our example the secondary Dial Circuit (interface 3) will back up the primary interface (interface 1).

```
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.

15.4 Configuring for WAN Reroute

15.4.1 Before You Begin

Before you can use WAN Reroute your routers must have the following connections:

- A leased line connection configured as the primary serial interface between two routers. The primary interface must be running PPP, PPP over Frame Relay or PSL.
- A dial-up connection on one of these two routers with a Dial Circuit configured as the alternate circuit.
- A dial-up connection on another router with a Dial Circuit configured to receive incoming calls.

In this example we will assume that Router A has a primary circuit to Router B, and an alternate circuit to Router C. The routers must be configured as follows:

- Router A must have an alternate Dial Circuit with the idle timer set to zero. Use the **set idle** command at the `Circuit Config>` prompt.
- The alternate Dial Circuit at Router A configured to send calls only. Use the **set calls outbound** command at the `Circuit Config>` prompt.
- Router C must have a Dial Circuit configured to receive calls only. Use the **set calls inbound** command at the `Circuit Config>` prompt.

Note: For WAN Reroute you must configure routing on the alternate interface for the Dial Circuit. The network address that you assign to the alternate interface must be different from the address assigned to the primary interface. The other protocol assignments for the primary interface are used on the alternate link when it is active.

15.4.2 Datalink Layer Configuration

The link layer protocols on the primary and alternate circuits must be configured as one of these combinations:

- PPP over both the primary and alternate interfaces
- PSL over both the primary and alternate interfaces
- PPP-FR over the primary interface and PPP over the alternate interface

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 alternate link.

All of the upper layer PPP configuration should be exactly the same between the primary link and the alternate link.

For information on PPP, PPP over Frame Relay, PSL, ISDN or V.25 *bis* see the appropriate chapters in this guide.

15.4.3 WAN Reroute Configuration Procedure

This section describes the steps required to configure WAN Reroute. Before you begin, enter **list device** at the `Config>` prompt to list the interface numbers of different devices.

In the following steps we assume that Router A has a primary link to Router B, and you are setting up an alternate link from Router A to Router C. Interface 1 on each router has already been configured as the primary interface using PPP, and no other interfaces have been configured. The procedure to configure the three routers can be summarized as follows:

- **Router A** – Configure the leased line to Router B as the primary circuit. Configure the Dial Circuit to make outgoing calls to Router C. Configure and enable WAN Reroute on router A to use the Dial Circuit as an *alternate* circuit.
- **Router B** – Configure the leased line circuit to Router A.
- **Router C** – Configure the Dial Circuit to accept incoming calls from Router A.

Note: You do not need to configure WAN Reroute on Routers B or C. Router A will manage the WAN Reroute processes.

15.4 Configuring for WAN Reroute

Follow these detailed steps on the Routers A and C to configure the alternate circuit for WAN Reroute.

15.4.3.1 Setting Up a V.25 *bis* or ISDN Dial Circuit as an Alternate Circuit

To set up a V.25 *bis* or ISDN Dial Circuit for use as an alternate circuit follow the set procedures as described for WAN Restoral in Section 15.3.3. The only difference is that when you set the call direction it is important to ensure that you set calls **inbound** at the alternate router (Router C) and **outbound** at the router which has the primary link (Router A).

```
Circuit Config>set calls direction
Circuit Config>
```

When you have configured these Dial Circuits you can use the WAN Restoral feature to configure WAN Reroute on router A.

15.4.3.2 Setting Up the WAN Reroute Feature

Follow these steps on the router with both the primary and alternate circuits (Router A) to configure WAN Reroute:

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 an alternate Dial Circuit to the primary interface. The alternate Dial Circuit will back up the primary interface.

```
WRS Config>add alternate-circuit
Alternate interface number  [0]? 3
Primary interface number  [0]? 1
```

3. Set the first stabilization interval for the primary interface if you want to override the inital default of 0 seconds.

```
WRS Config>set first-stabilization
Primary interface number  [0]? 1
First primary stabilization time  (0 - 3600 seconds -1 = default) [-1]? 30
```

4. Set the subsequent stabilization interval for the primary interface if you want to override the inital default of 0 seconds.

```
WRS Config>set stabilization
Primary interface number  [0]? 1
First primary stabilization time  (0 - 3600 seconds -1 = default) [-1]? 20
```

5. Enable WAN Reroute on the alternate Dial Circuit that you added.

```
WRS Config>enable alternate-circuit
Alternate interface number  [0]? 3
```

6. Globally enable WAN Reroute on the router. For example:

```
WRS Config>enable wrs
```

7. Restart the router for configuration changes to take effect.

15.5 Changing from WAN Restoral to WAN Reroute

If you have been using WAN Restoral with a primary connection between Routers A and B and a secondary Dial Circuit as back up you may decide to back up the primary connection by a Dial Circuit to a third router (Router C). To make this change you must:

1. Disable the secondary circuits and disable WAN Restoral at Routers A and B.
2. Configure an appropriate routing protocol on the Dial Circuit at Router A and Router C.
3. Configure the Dial Circuit as an alternate circuit on Router A. Ensure that it is set to make outgoing calls, and that Router C is set to receive those calls.
4. Enable WAN Reroute on Router A.

15.6 Changing from WAN Reroute to WAN Restoral

If you have been using WAN Reroute with a primary connection between Router A and Router B with an alternate interface from Router A to Router C, you may decide to back-up the primary connection using WAN Restoral from Router A to Router B instead. You will have configured at least one routing protocol on the back-up Dial Circuit interface (for example IP or OSI) at Router A. You must:

1. Disable the alternate circuit and disable WAN Reroute at Router A.
2. Delete all routing protocols on the circuit which was the alternate interface at Router A.
3. Configure the Dial Circuit as a secondary circuit on Routers A and B. Ensure that one is set to make ougoing calls, and the other is set to receive those calls.
4. Enable WAN Restoral on Routers A and B.

15.7 WAN Restoral and Reroute Configuration and Console Commands

Table 15–1 lists the WAN Restoral feature configuration and console commands. You use these commands to configure and monitor both WAN Restoral and WAN Reroute. The sections that follow explain the commands in more detail.

Enter configuration commands at the `WRS Config>` prompt. Enter console (monitoring) commands at the `WRS>` prompt.

Table 15–1 WAN Restoral Feature Configuration and Console Commands

Command	Task	Function
? (Help)	Configure/Monitor	Displays all WAN Restoral commands or lists subcommand options for specific commands.
Add	Configure	Assigns a Dial Circuit as the secondary or alternate (backup) circuit to a primary interface.
Clear	Monitor	Clears the monitoring information/statistics on all restoral circuits.
Disable	Configure/Monitor	Disables WAN Restoral on the router or it disables the restoral of a primary interface by disabling its associated secondary or alternate interface.
Enable	Configure/Monitor	Enables WAN Restoral on the router or it enables a secondary or alternate Dial Circuit.
List	Configure/Monitor	Displays the current WAN Restoral/Reroute configuration, or monitor information on one or all restored circuits.
Remove	Configure	Removes the assignment of a secondary or alternate (backup) circuit to the primary interface.
Set	Configure/Monitor	Sets the stabilization intervals for the primary interface. (WAN Reroute only).
Exit	Configure/Monitor	Exits the WAN Restoral and returns to the previous prompt level.

15.7 WAN Restoral and Reroute Configuration and Console Commands

? (Help) C M

Lists available commands. You can also enter **?** after a command to list its options.

Syntax: ?

Example:

```
enable ?
alternate-circuit
secondary-circuit
wrs
```

Add C

Assigns a Dial Circuit as the secondary or alternate (backup) circuit to a primary interface. Both interfaces must have been previously configured. You can assign only one secondary interface or alternate interface to a primary interface. Any Dial Circuit is an eligible secondary or alternate interface.

Syntax: add

alternate-circuit . . .

secondary-circuit . . .

Example:

```
add secondary-circuit
Secondary interface number  [0]? 3
Primary interface number  [0]? 0
```

Clear M

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:

```
clear
```

15.7 WAN Restoral and Reroute Configuration and Console Commands

Disable C M

Globally disables WAN Reroute or WAN Restoral on the router, or disables the restoral of a primary interface by disconnecting its associated alternate circuit or secondary circuit.

Syntax: disable

alternate-circuit . . .
secondary-circuit . . .
wrs

alternate-circuit ***interface #***

Disconnects an active call on the alternate circuit. The circuit remains disabled until you restart or reload the router or until you enter the **enable alternate** command. Both interfaces must have been previously configured and bound together in the WRS configuration.

Example:

```
disable alternate-circuit
Alternate interface number  [0]? 3
```

Note: To disable the alternate circuit, enter **disable alternate** at the WAN Restoral configuration prompt (`WRS Config>`).

secondary-circuit ***interface #***

Disconnects an 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 Reroute or WAN Restoral on the router until you restart or reload the router or enter the **enable wrs** command.

Example:

```
disable wrs
```

15.7 WAN Restoral and Reroute Configuration and Console Commands

Enable C M

Enables WAN Reroute or WAN Restoral on the router or enables the restoral of a primary link by enabling its associated backup circuit, which is either an alternate circuit (WAN Reroute) or a secondary circuit (WAN Restoral).

Syntax: enable

alternate-circuit . . .
secondary-circuit . . .
wrs

alternate-circuit ***interface #***

Enables the restoral of a primary interface by enabling its associated alternate Dial Circuit. The Dial Circuit must have been previously assigned using the **add alternate** command.

Example:

```
enable alternate-circuit
Alternate interface number  [0]? 3
```

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 or WAN Reroute on the router.

Example:

```
enable wrs
```

15.7 WAN Restoral and Reroute Configuration and Console Commands

List C

Displays the current WAN Restoral or WAN Reroute configuration. If WAN Restoral has been configured this command lists each primary and secondary interface and whether or not WAN Restoral is enabled. If WAN Reroute has been configured this command lists each primary and alternate interface and whether or not WAN Reroute is enabled.

Syntax: list

This is an example with WAN Restoral configured on the router.

Example:

```
list
WAN Restoral is enabled.
Default Stabilization Time:       0 seconds
Default First Stabilization Time: 0 Seconds

                                            Secondary
Primary Interface    Secondary Interface   Enabled
-----------------    --------------------  ---------
1 - WAN PPP          4 - PPP Dial Circuit      Yes
```

This is an example with WAN Reroute configured on the router.

Example:

```
list
WAN Restoral is enabled.
Default Stabilization Time:       0 seconds
Default First Stabilization Time: 0 Seconds

[No Primary-Secondary pairs defined]
                                                 Alternate   1st  Subseq
  Primary Interface      Alternate Interface    Enabled     Stab  Stab
---------------------  -----------------------  --------    ----  ----
 1 - WAN PPP            3 - PPP Dial Circuit       Yes      dflt  dflt
```

15.7 WAN Restoral and Reroute Configuration and Console Commands

List M

Displays the current WAN Restoral or WAN Reroute configuration. If WAN Restoral has been configured this command lists each primary and secondary interface and whether or not WAN Restoral is enabled. If WAN Reroute has been configured this command lists each primary and alternate interface and whether or not WAN Reroute is enabled.

Syntax: list

alternate-circuit . . .
circuit
secondary-circuit . . .
status

alternate-circuit

Provides statistics for individual alternate circuits and their associated primary interfaces.

Example:

```
list alternate-circuit
Alternate interface number  [0]? 3
Primary    1:PPP/0 Point to Point SCC Serial Line
Alternate  3:PPP/1 Point to Point V.25bis Dial Circuit
Enabled, re-route currently active
Primary first stabilization time: default (0 seconds)
Primary stabilization time: default (0 seconds)
```

Alternate Interface number	Identifier of the Interface that is being used for the back up circuit.
Primary	Interface that is being backed up.
Alternate	Dial Circuit that is being used to back up the associated primary.
Enabled	Indicates whether or not WAN Reroute is currently enabled on these interfaces, and whether it is currently active
Primary first stabilization time	Indicates the current setting for the first stabilization time. If it is set to *default* then the default value is shown in parentheses.
Primary stabilization time	Indicates the current setting for the subsequent stabilization time. If it is set to *default* then the default value is shown in parentheses.

15.7 WAN Restoral and Reroute Configuration and Console Commands

circuit

Provides statistics for all alternate or secondary Dial Circuits and their associated primary interfaces.

Example:

```
list circuit
The WRS feature is enabled with 1 circuit configured
  Total restoral/reroute attempts =         5 completions   =         3
  Total packets forwarded         =       346
  Longest completed restoral period in hrs:min:sec     0:08:22

   Primary       Secondary    Restoral  Restoral   Current/Longest
Net Interface  Net Interface  Enabled    Active       Duration
-------------  -------------  --------  --------   ---------------
[No WAN Restoral circuits configured]

   Primary       Alternate    Re-route  Re-route   Current/Longest
Net Interface  Net Interface  Enabled    Active       Duration
-------------  -------------  --------  --------   ---------------
  1  PPP/0       3  PPP/1       Yes        No           0:08:22
```

The WRS feature is . . .	Indicates the status of WRS (**enabled** or **disabled**), and the number of circuits configured as secondary or alternate circuits.
Total restoral/reroute attempts	Number of times the primary failed, causing the router to try to bring up a secondary (or alternate) link.
Completions	Number of successful restoral (or reroute) attempts.
Total packets forwarded	Packets forwarded across the secondary (or alternate) interface. It is the sum of both directions, and is cumulative until you restart the router or enter the **clear** command.
Longest completed restoral period	Longest amount of time a restoral (or reorute) was in operation not counting any current usage.

WAN Restoral Circuits

Primary Net Interface	Interface that is being backed up.
Secondary Net Interface	Dial Circuit that is being used to back up the associated primary, using WAN Restoral.
Restoral Enabled	Indicates whether or not WAN Restoral is currently enabled on these interfaces.

15.7 WAN Restoral and Reroute Configuration and Console Commands

Restoral Active	Indicates whether or not WAN Restoral is currently active on these interfaces.
Current/Longest Duration	Length of time the restoral has been in operation, if the backup circuit is currently in use, otherwise it is the longest amount of time a restoral was in operation.

WAN Reroute Circuits

Primary Net Interface	Interface that is being backed up.
Alternate Net Interface	Dial Circuit that is being used to back up the associated primary, using WAN Reroute.
Re-route Enabled	Indicates whether or not WAN Reroute is currently enabled on these interfaces.
Re-route Active	Indicates whether or not WAN Reroute is currently active on these interfaces.
Current/Longest Duration	Length of time the reroute has been in operation, if the backup circuit is currently in use, otherwise it is the longest amount of time a reroute was in operation.

secondary-circuit

Provides statistics for individual secondary circuits and their associated primary interfaces.

Example:

```
list secondary-circuit
  Secondary interface number  [0]? 1
                                                            Restoral
   Primary Interface      Secondary Interface               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
```

15.7 WAN Restoral and Reroute Configuration and Console Commands

Primary Net Interface — Interface that is being backed up.

Secondary Net Interface — Dial Circuit that is being used to back up the associated primary, using WAN Restoral.

Router primary Interface state — Indicates that the primary interface state is one of the following:

- **Up** – The link is up.
- **Down** – The link is down.
- **Disabled** – The operator has disabled the link.
- **Not present** – The link is configured but there is a hardware problem.

Restoral Enabled — Indicates whether or not WAN Restoral is currently enabled on these interfaces.

Router secondary Interface state — Indicates that the associated secondary interface state is one of the following:

- **Up** – The link is up.
- **Down** – The link is down. This also occurs when the base network for the secondary is disabled, either at the `Config>` prompt or at the `+` prompt.
- **Available** – The link is in the waiting mode.

Restoral Statistics:

Primary Restoral Attempts — Number of times the primary failed, causing the router to try to bring up this secondary link.

Restoral Packets forwarded — Packets forwarded over the secondary link.

Most recent Restoral Period — How long the secondary was up, the last time it was used, or currently in use.

15.7 WAN Restoral and Reroute Configuration and Console Commands

status

Provides status information for individual secondary circuits (or alternate circuits) and their associated primary interfaces.

Example:

```
list status
The WRS feature is enabled with 1 circuit(s) configured

  Total restoral/reroute attempts =          5 completions   =         1
  Total packets forwarded         =          8

  Longest completed restoral period in hrs:min:sec     0:00:14

Restoral State   Primary Interface & State   Secondary Interface & State
--------------   -------------------------   ---------------------------
Available         1  PPP/0  - Up               3  PPP/1  - Available

Reroute State    Primary Interface & State   Alternate Interface & State
-------------    -------------------------   ---------------------------
[No WAN Reroute circuits configured]
```

The WRS feature is	Indicates the status of WRS (**enabled** or **disabled**), and the number of circuits configured as secondary or alternate circuits.
Total restoral/ reroute attempts	Number of times the primary failed, causing the router to try to bring up a secondary (or alternate) link.
Completions	Number of successful restoral (or reroute) attempts.
Total packets forwarded	Packets forwarded across the secondary (or alternate) interface. It is the sum of both directions, and is cumulative until you restart the router or enter the **clear** command.
Longest completed restoral period	Longest amount of time a restoral (or reorute) was in operation not counting any current usage.

15.7 WAN Restoral and Reroute Configuration and Console Commands

WAN Restoral Circuits

Restoral State	Indicates the current state of WAN Restoral: • **Available –** The primary circuit is up and the secondary circuit is down, but available when required. • **Starting –** The primary link has gone down and the router is attempting to connect the secondary circuit. • **Restoring** – The secondary circuit has come up and is active while the primary circuit remains down. • **Recovering** – The primary circuit has come back up but the secondary circuit has not gone down yet. The router is in the process of switching from the secondary circuit to the primary. **Starting** and **Recovering** are transition states.
Primary Interface & State	Identifies the interface that is being backed up, and its current state.
Secondary Interface & State	Identifies the Dial Circuit that is being used to back up the associated primary, using WAN Restoral, and its current state.

WAN Reroute Circuits

Reroute State	Indicates the current state of WAN Reroute: • **Available** – The primary circuit is up and the secondary circuit is down, but available when required. • **Starting** – The primary link has gone down and the router is attempting to connect the alternate circuit. • **Restoring** – The alternate circuit has come up and is active while the primary circuit remains down. • **Recovering** – The primary circuit has come back up but the alternate circuit has not gone down yet. The router is in the process of switching from the alternate circuit to the primary. **Starting** and **Recovering** are transition states.
Primary Net Interface	Identifies the interface that is being backed up, and its current state.
Alternate Net Interface	Identifies the Dial Circuit that is being used to back up the associated primary, using WAN Reroute, and its current state.

15.7 WAN Restoral and Reroute Configuration and Console Commands

Remove **C**

Deletes the assignment of a secondary (backup) Dial Circuit (or alternate Dial Circuit) to the primary interface. The Dial Circuit must have been previously assigned using the **add secondary** command or the **add alternate** command.

Syntax: remove

alternate-circuit . . .
secondary-circuit . . .

Example:

```
remove secondary-circuit
Secondary interface number  [0]? 3
```

Set **C M**

Globally sets the first and subsequent stabilization intervals for WAN Reroute on the router.

If the primary circuit is down after power-up the router waits for the period defined as the *first-stabilization interval* before activating the alternate circuit.

When the alternate circuit is active and the primary circuit comes back on-line, the router waits for the period defined as the subsequent *stabilization interval* before activating the primary circuit and taking the back-up circuit down. If the primary circuit fails during the stabilization time, the alternate circuit continues to run.

These parameters can be used to reduce the amount of line switching if the primary circuit is unstable.

Syntax: set

default first-stabilization. . .
default stabilization. . .
first-stabilization . . .
stabilization . . .

15.7 WAN Restoral and Reroute Configuration and Console Commands

default first-stabilization

Sets the interval that will be used by WAN Reroute as a default value for the first-stabilization time. The value is the number of seconds, in the range 0 through 3600. The default value is 0.

Example:

```
set default first-stabilization
Default primary first stabilization time  (0 - 3600 seconds)  [0]? 20
```

default stabilization

Sets the interval that will be used by WAN Reroute as a default value for the subsequent stabilization time. The value is the number of seconds, in the range 0 through 3600. The default value is 0.

Example:

```
set default stabilization
Default primary stabilization time  (0 - 3600 seconds)[0]? 15
```

first-stabilization

Sets the interval that will be used by WAN Reroute as the first-stabilization time. The value is the number of seconds, in the range 0 through 3600. The default value is initially -1, which means that the value of the default first-stabilization interval will be used. If you set first-stabilization again, the default will be the last value specified.

Example:

```
set first-stabilization
Primary interface number  [0]?  1
Primary first stabilization time  (0 - 3600 seconds, -1 = default)  [-1]? 30
```

stabilization

Sets the interval that will be used by WAN Reroute as the stabilization time. The value is the number of seconds, in the range 0 through 3600. The default value is initially -1, which means that the value of the default stabilization interval will be used. If you set stabilization again, the default will be the last value specified.

Example:

```
set stabilization
Primary interface number  [0]?  1
Primary stabilization time  (0 - 3600 seconds, -1 = default)  [-1]? 25
```

Exit C M

Returns to the previous prompt level.

Syntax: exit

Example:

`exit`

15.8 WAN Restoral and GWCON Commands

You can test the WAN Restoral secondary circuit or WAN Reroute alternate 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 (or alternate) circuit remains available for WAN Restoral. To disable the WAN Restoral feature, enter **disable** at the `WRS Config>` prompt.

16

Configuring and Monitoring the X.25 Switching Feature

This chapter describes how to configure and monitor the X.25 Switching feature.

For more information on the X.25 Switching feature refer to the *Routing Protocols Reference Guide*.

16.1 Accessing the X.25 Switching Feature Configuration and Console Environments

You configure X.25 Switching using the X.25 switching feature.

To access the X.25 switching feature configuration environment, use the **feature x25s** command at the `Config>` prompt.

Note: After you access the X.25 Switching feature configuration process, you may begin entering configuration commands. Whenever you make changes to a user-configurable feature parameter, you must restart the router for this change to take effect.

To display the `X25S>` prompt enter **feature x25s** at the GWCON (+) prompt. Any modifications made using the monitoring (console) commands are not maintained across restarts.

Example:

```
+ feature x25s
X25 Switching console
X25S>
```

Refer to Chapter 1 for information about accessing the configuration and console processes.

16.2 X.25 Switching Basic Configuration Procedure

16.2.1 Before You Begin

Before you can use X.25 Switching you must have the following:

- An interface configured to receive the incoming X.25 calls which you want to switch. This may be an X.25 network interface or an X.25-LLC2 pseudo interface.
- An interface configured for an X.25 connection to the target DTE. This may be an X.25 network interface or an X.25-LLC2 pseudo interface.

Refer to Chapter 12 for information about configuring an X.25 network interface, or an X.25-LLC2 pseudo interface.

16.2.1.1 Setting Up the X.25 Switching Feature

When you have configured the X.25 network interfaces you use the X.25 Switching feature to configure and enable X.25 switching. Follow these steps to configure the X.25 Switching feature:

1. At the `Config>` prompt enter **feature x25s** to display the `X25S Config>` prompt. For example:

   ```
   Config>feature x25s
   X.25 Switching user configuration
   X25S Config>
   ```

2. Create a filter for each incoming X.25 call, or set of related calls, that is to be switched. Each filter must have a unique name. The filter parameters can identify the incoming call by the interface it arrived on, closed user group membership, the called or calling DTE address, the call data, the NUI string or the called or calling NSAP address. For example:

   ```
   X25S Config>add filter
   Filter name  []? xfilter1
   Priority (1-65535) [1]?
   Ifc  []? 1
   Closed User Group  []?
   Called DTE address  []?
   Calling DTE address  []? 123000456321
   Call user data  []?
   NUI  []?
   Called NSAP  []?
   Calling NSAP  []?
   ```

Note: If all of the filter options, except the name and priority, are left empty the filter will match all incoming calls.

3. Create clients for the target DTEs and associate filters with clients. The clients identify the target DTE for incoming X.25 calls which match the associated filter parameters. A client may be associated with multiple filters, for example:

```
X25S Config>add client
Name []?  xclient1
Ifc []?  0
Destination DTE address  []? 123000654321
Local DTE subaddress  []? 12
Filter name  []? xfilter1
Filter name  []? xfilter2
Filter name  []?
```

4. By default the filters, clients and X.25 switching are enabled. If any component has been disabled using the **disable** command, it will not be active unless you re-enable it. For example:

```
X25S Config>enable x25-switching
```

Note: If a filter is disabled, then it is not checked against incoming calls. If a client is disabled then calls matching an associated filter will be blocked. If you create a low priority catch-all filter and assign it to a disabled client, then you can exclude all calls which do not match the other defined filters.

5. Exit from the X25 Switching configuration environment. For example:

```
X25S Config>exit
```

16.2.1.2 DCE Configuration

When configuring a pair of network interfaces for use with X.25 switching, you should configure the LLC2 interface on the router as a DCE. Otherwise, the X.25 software will reject DTE-specific facilities (for example, NUI) if they are received at a DTE interface. Similarly, DCE-specific facilities (for example, charging information) received at a DTE interface will be rejected if the outgoing interface is also a DTE.

To configure an interface as a DCE, perform the following steps:

16.3 X.25 Switching Configuration and Console Commands

1. At the `Config>` prompt use the **net** command to access the X.25-LLC2 configuration process. For example:

```
Config>net 3
X.25 Switching user configuration
X25-LLC2 Config>
```

2. Use the **set equipment-type dce** command to configure this interface as a DCE. For example:

```
X.25-LLC2 Config> set equipment-type dce
X25-LLC2 Config>
```

16.3 X.25 Switching Configuration and Console Commands

Table 16–1 lists and the rest of the section explains the X.25 Switching configuration and console commands.

Enter configuration commands at the `X25S Config>` prompt.

Enter console commands at the `X25S>` prompt.

Table 16–1 X.25 Switching Configuration and Console Command Summary

Command	Task	Function
? (Help)	Configure/ Monitor	Displays all the X.25 switching commands or lists subcommand options for specific commands.
Add	Configure	Adds a new filter or client.
Change	Configure	Modifies the configuration of an existing filter or client.
Delete	Configure	Deletes a filter or client.
Disable	Configure/ Monitor	Disables the use of a filter or client or globally disables the X.25 switching feature.
Enable	Configure/ Monitor	Enables the use of a filter or client or globally enables the X.25 switching feature.
List	Configure/ Monitor	Displays the current information of all filters and clients.
Set	Configure/ Monitor	Sets a priority for the implicit filters used for routing calls and the maximum number of circuits.
Show	Configure/ Monitor	Displays the configured settings of a selected filter or client or X.25 switching.
Exit	Configure/ Monitor	Exits the config and monitor processes and returns to the previous prompt level.

16.3 X.25 Switching Configuration and Console Commands

? (Help) C M

Lists available commands. You can also enter **?** after a command to list its options.

Syntax: ?

Example:

```
X25S Config>?
SHOW
LIST
ADD
CHANGE
DELETE
ENABLE
DISABLE
SET
EXIT
```

Example:

```
enable ?
FILTER
CLIENT
X25-SWITCHING
```

Add C

Creates a new filter or client definition. Filters are used to identify the incoming X.25 calls which must be switched. Clients are used to identify the target DTE for calls which match their associated filters.

An incoming X.25 call is compared with the profiles of the defined filters. If the call matches a filter, it is switched to the target DTE identified by the client associated with the matching filter.

Syntax: add

client . . .

filter . . .

16.3 X.25 Switching Configuration and Console Commands

client

Defines a new client profile.

Example:

```
add client
Name []? xclient1
Ifc []? 0
Destination DTE address []? 123000654321
Local DTE subaddress []? 12
Filter name []? xfilter1
Filter name []?
```

Name	Specifies the unique name for this client profile. This parameter is mandatory.
Ifc	Specifies the interface which connects to the destination DTE. This parameter is mandatory. The interface must be configured for X.25 or X.25-LLC2.
Destination DTE address	The X.25 address of the target DTE that calls will be switched to. The DTE address has a maximum of 15 digits.
Local DTE subaddress	The DTE subaddress which will be used for calls switched to the destination DTE. The subaddress has a maximum of 15 digits.
Filter name	Specifies the name of the filter which the client is associated with. You cannot associate a filter with more than one client. **Note:** You can associate multiple filters with one client. The system repeatedly prompts for the next filter name in the list. Press the Return key without entering a name to complete the list.

16.3 X.25 Switching Configuration and Console Commands

filter

Adds a new filter. An incoming call matches a filter if its profile matches all of the parameters which have been defined for the filter. If all of the filter parameters are empty, the filter will match *all* incoming calls.

Example:

```
add filter
Name []? xfilter1
Priority (1-65535) [1]?
Ifc []? 1
Closed User Group []?
Called DTE address []?
Calling DTE address []? 123000456123
Call user data []?
NUI []?
Called NSAP []?
Calling NSAP []?
```

Name	Specifies the unique name for this incoming call filter profile. This parameter is mandatory.
Priority	Specifies the relative priority of this filter. Call profiles are compared with the filters with the highest priority value first, and the first matching filter is the one which is used. Range: 1 (lowest priority) through 65,535 (highest priority). Default: 1
Ifc	The network interface number of the DTE on which to look for incoming calls.
Closed User Group	Specifies the name of a Closed User Group. The Closed User Group name consists of up to 4 digits.
Called DTE address	Specifies the X.25 address of the destination DTE. Incoming calls addressed to this DTE will match this filter parameter, and will be switched to the associated client. The X.25 address is a string of up to 15 digits or wildcard characters. The wildcard character **?** matches any single character, and ***** matches any string of any length. For example, **12300065432?** matches all DTE addresses from 123000654320 through 123000654329**,** and **123*** matches all DTE addresses which begin with 123.

Calling DTE address	Specifies the X.25 address of the sending DTE. The X.25 address is a string of up to 15 digits or wildcard characters.
Call user data	Specifies the contents of the Call User Data field, and consists of up to 128 pairs of hexadecimal digits. Each pair of digits defines one byte.
NUI	Specifies the Network User Identification (NUI) code. The NUI consists of up to 128 pairs of hexadecimal digits. Each pair of digits defines one byte.
Called NSAP	Specifies the NSAP address of the destination DTE. The NSAP address consists of 2 to 42 hexadecimal digits.
Calling NSAP	Specifies the NSAP address of the sending DTE. The NSAP address consists of 2 to 42 hexadecimal digits.

Change C

Modifies a filter or client definition which was created using the **add** command.

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

Syntax: change

client . . .
filter . . .

16.3 X.25 Switching Configuration and Console Commands

client

Modifies the definition of an existing client profile. The prompts that appear depend on the current settings of the client you are modifying, and which parameters you choose to modify. The prompts display the current setting of each parameter, and ask you to confirm the value. If you answer **No**, the next prompt asks for the new setting.

Example:

```
change client
Name []? xclient1
Ifc [0]?
Called DTE address = 123000654321? [Yes]:
Local DTE subaddress = 12? [Yes]: No
Local DTE subaddress []?  14
Filter: xfilter1?  [Yes]:
Filter name []?
```

Name	Specifies the name of the client profile you want to modify. This parameter is mandatory.
Ifc	Specifies the interface which connects to the destination DTE. This parameter is mandatory. The interface must be configured for X.25 or X.25-LLC2.
Destination DTE address	The X.25 address of the target DTE that calls will be switched to. The DTE address has a maximum of 15 digits.
Local DTE subaddress	The DTE subaddress which will be used for calls switched to the destination DTE. The subaddress has a maximum of 15 digits.
Filter name	Specifies the name of the filter, or filters, which the client is associated with. **Note:** You can associate multiple filters with one client. The system repeatedly prompts for the next filter name in the list. Press the Return key without entering a name to complete the list.

16.3 X.25 Switching Configuration and Console Commands

filter

Modifies the definition of an existing filter profile. The prompts that appear depend on the current settings of the filter you are modifying, and which parameters you choose to modify. If a parameter has already been set the prompts display the current setting, and ask you to confirm the value. If you answer **No** the next prompt asks for the new setting.

Example:

change filter

```
Name []? xfilter1
Priority (1-65535) [1]?
Ifc = 1? [Yes]:
Closed User Group []?
Called DTE address []?
Calling DTE address = 123000456123? [Yes]: No
Calling DTE address []? 123000456*
Call user data []?
NUI []?
Called NSAP []?
Calling NSAP []?
```

Name	Specifies the name of the incoming call filter profile which you want to modify. This parameter is mandatory.
Priority	Specifies the relative priority of this filter. Call profiles are compared with the filters with the highest priority value first, and the first matching filter is the one which is used. Range: 1 (lowest) through 65,535 (highest priority). Default: 1
Ifc	The network interface number of the DTE on which to look for incoming calls.
Closed User Group	Specifies the name of a Closed User Group. The Closed User Group name consists of up to 4 digits.
Called DTE address	Specifies the X.25 address of the destination DTE. Incoming calls addressed to this DTE will match this filter parameter, and will be switched to the associated client. The X.25 address is a string of up to 15 hexadecimal digits or wildcard characters.

Calling DTE address	Specifies the X.25 address of the sending DTE. The X.25 address is a string of up to 15 hexadecimal digits or wildcard characters.
Call user data	Specifies the contents of the Call User Data field, and consists of up to 128 pairs of hexadecimal digits. Each pair of digits defines one byte.
NUI	Specifies the Network User Identification (NUI) code. The NUI consists of up to 128 pairs of hexadecimal digits.
Called NSAP	Specifies the NSAP address of the destination DTE. The NSAP address consists of 2 to 42 hexadecimal digits.
Calling NSAP	Specifies the NSAP address of the sending DTE. The NSAP address consists of 2 to 42 hexadecimal digits.

Delete C

Deletes a client or a filter.

Note: The **delete** command does *not* prompt for confirmation before deleting the named client or filter.

Syntax: delete
client . . .
filter . . .

client *client-name*

Deletes the named client.

Example:

```
delete client
Name []? xclient1
```

filter *filter-name*

Deletes the named filter.

Example:

```
delete filter
Name []? xfilter1
```

16.3 X.25 Switching Configuration and Console Commands

Disable C M

Disables a named client or filter, or globally disables X.25 switching on the router.

Note: If you disable a client, filter or X25 Switching from the `X25S>` prompt it remains disabled until you restart or reload the router, or enable it again using the **enable** command.

Syntax: disable
client . . .
filter . . .
x25-switching

client *client-name*

Disables the named client. When the client is disabled, calls which match an associated filter are blocked. The client remains disabled until you enter the **enable client** command.

Example:

```
disable client
Name []? xclient1
```

filter *filter-name*

Disables the named filter. Incoming calls are not checked against filters which are disabled. The filter remains disabled until you enter the **enable filter** command.

Example:

```
disable filter
Name []? xfilter1
```

x25-switching

Globally disables the X.25 switching feature on the router. The feature remains disabled until you enable it again using the **enable x25-switching** command.

Example:

```
disable x25-switching
```

16.3 X.25 Switching Configuration and Console Commands

Enable **C M**

Enables X.25 Switching on the router or enables individual clients or filters which have previously been disabled using the **disable** command.

Syntax: enable

client . . .
filter . . .
x25-switching

client ***client-name***

Enables the named client which was previously disabled using the **disable client** command. When a client is enabled, calls which match an associated filter are switched to the destination DTE. Clients are enabled by default when they are created using the **add client** command.

Example:

```
enable client
Name []? xclient1
```

filter ***filter-name***

Enables the named filter which was previously disabled using the **disable filter** command. When you create a filter using the **add filter** command it is enabled by default.

Incoming calls are checked against enabled filters. The filter remains enabled until you enter the **disable filter** command.

Example:

```
enable filter
Name []? xfilter1
```

x25-switching

Globally enables the X.25 switching feature on the router, previously disabled using the **disable x25-switching** command. X.25 switching is enabled by default.

Example:

```
enable x25-switching
```

16.3 X.25 Switching Configuration and Console Commands

List **C M**

Displays the configuration options and status of all of the X.25 Switching clients or X.25 Switching filters. The **list** command only displays values for options which have been configured.

Syntax: list
client
filter

client

Provides a list of all of the configured clients, and indicates whether they are enabled or disabled.

In the example below, calls matching the filter **xfilter1** are switched to DTE 123000654321 with subaddress 14, and calls matching filter **xfilter2** or **xfilter3** are switched to DTE 123000654322 with subaddress 15:

Example:

```
list client
xclient1        ENABLED  Ifc = 0
                Called DTE address   = 123000654321
                Local DTE subaddress = 14

                Filters:
                    xfilter1


xclient2        ENABLED  Ifc = 0
                Called DTE address   = 123000654322
                Local DTE subaddress = 15

                Filters:
                    xfilter2
                    xfilter3
```

Name	Displays the unique name for this client profile.
Enabled	Indicates whether or not this client is currently ENABLED or DISABLED.
Ifc	Displays the interface which connects to the destination DTE.

Called DTE address	Displays the X.25 address of the target DTE that calls will be switched to. The DTE address has a maximum of 15 digits.
Local DTE subaddress	Displays the DTE subaddress which is used for calls switched to the destination DTE. The subaddress has a maximum of 15 digits.
Filter name	Displays the name of the filter, or filters, which the client is associated with.

filter

Provides a list of the filters and indicates whether they are enabled or disabled.

Note: From the `X.25S>` prompt, this command only displays the filters which are associated with clients. From the `X.25S config>` prompt it displays *all* configured filters.

In the example below, **xfilter1** has the lowest priority, and matches all incoming calls on interface 1 from DTEs with addresses which begin 123000456, **xfilter2** has a higher priority and matches all calls for the closed user group 5432 (this overrides xfilter1), and **xfilter3** has the highest priority and matches any calls addressed to DTE 123000654322:

Example:

```
list filter
xfilter1         ENABLED  Priority = 1
                Ifc = 1
                Calling DTE address = 123000456*


xfilter2         ENABLED  Priority = 100
                Ifc = 1
                Closed User Group  = 5432


xfilter3         ENABLED  Priority = 200
                Ifc = 1
                Called DTE address  = 123000654322
```

Name	Displays the unique name for this incoming call filter profile.
Enabled	Indicates whether or not this filter is currently ENABLED or DISABLED

16.3 X.25 Switching Configuration and Console Commands

Priority	Displays the relative priority of this filter. Call profiles are compared with the filters with the highest priority value first, and the first matching filter is the one which is used. Range: 1 (lowest priority) through 65,535 (highest priority) Default:1
Client	Displays the name of the client that this filter is associated with.
Ifc	Displays the network interface number of the DTE on which to look for incoming calls.
Closed User Group	Displays the name of a Closed User Group. The Closed User Group name consists of up to 4 digits.
Called DTE address	Displays the X.25 address of the destination DTE.
Calling DTE address	Displays the X.25 address of the sending DTE. The X.25 address is a string of up to 15 digits or wildcard characters (*).
Call user data	Displays the contents of the Call User Data field, and consists of up to 128 pairs of hexadecimal digits. Each pair of digits defines one byte.
NUI	Displays the Network User Identification (NUI) code. The NUI consists of up to 128 pairs of hexadecimal digits.
Called NSAP	Displays the NSAP address of the destination DTE. The NSAP address consists of 2 to 42 hexadecimal digits.
Calling NSAP	Displays the NSAP address of the sending DTE. The NSAP address consists of 2 to 42 hexadecimal digits.

16.3 X.25 Switching Configuration and Console Commands

Set **C M**

Sets the priority of the implicit filters used for routing calls, and the maximum number of X.25 circuits that can be switched.

Syntax: set x25-switching

x25-switching

Example:

```
set x25-switching
Routing Priority (1-65535)  [255]? 20
Maximum Circuits (1-65535)  [100]? 50
```

Routing Priority Specifies the priority of the implicit filters which are used to handle routing calls (as opposed to switching calls).

Range: 1 (lowest priority) through 65,535 (highest priority).

Default: 255.

Maximum Circuits Specifies the maximum number of X.25 circuits that can be switched at any one time.

Range: 1 through 65,535

Default: 100

Show **C M**

Displays the configuration options and status of the X.25 Switching feature or a selected client or filter. The **show** command only displays values for options which have been configured. The options displayed are described under the **add** command.

Syntax: show
client
filter
x25-switching

16.3 X.25 Switching Configuration and Console Commands

client *client-name*

Displays the configuration and status of the named client.

Example:

```
show client
Name  []? xclient1

                ENABLED  Ifc = 0
                Called DTE address   = 123000654321
                Local DTE subaddress = 14

                Filters:
                    xfilter1
```

filter *filter-name*

Displays the configuration and status of the named filter.

Example:

```
show filter
Name  []? xfilter3

xfilter3         ENABLED  Priority = 200
                Ifc = 1
                Called DTE address  = 123000654322
```

x25-switching

Displays the status, routing priority and maximum circuits settings of the X.25 switching feature.

Example:

```
X25S Config>show x25-switching
ENABLED   Routing Priority =   255  Maximum Circuits =   100
```

Example:

```
X25S>show x25-switching
ENABLED  Routing Priority =  255  Circuits:Active/Maximum =  0/  100
```

Enabled	Displays the status of X.25 Switching, either ENABLED or DISABLED.
Routing Priority	Displays the priority of the implicit filters which are used to handle routing calls.

Circuits:

Active	Displays the number of X.25 circuits that are currently being switched. This field is only displayed from the X.25 switching console process.
Maximum	Displays the maximum number of X.25 circuits that can be switched at any one time.

Exit **C M**

Returns to the previous prompt level.

Syntax: exit

Example:

```
exit
```

Appendices

A

X.25 National Personalities

This appendix lists the default settings for GTE-Telenet and DDN.

A.1 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

A.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

B

ISDN Cause Codes

Table B–1 lists the ISDN Cause codes and their descriptions. Frame Relay services also report some of these cause codes.

Table B–1 ISDN Cause Code Summary

Class 765	Value 4321	Number	Cause Description
000	0001	1	Unassigned (unallocated) Number
000	0010	2	No route to specified network
000	0110	6	Channel unacceptable
001	0000	16	Normal, clearing
001	0001	17	User busy
001	0010	18	No user responding
001	0011	19	No answer from user (user alerted)
001	0101	21	Call rejected
001	0110	22	Number changed
001	1011	27	Destination out of order
001	1100	28	Invalid Number Format (Incomplete number)
001	1101	29	Requested facility rejected
001	1110	30	Response to STATUS ENQuiry
001	1111	31	Normal, Unspecified
010	0010	34	No channel available
010	0011	35	Call Queued
010	0110	38	Network out of order
010	1001	41	Temporary failure

Table B–1 ISDN Cause Code Summary (Continued)

Class 765	Value 4321	Number	Cause Description
010	1010	42	Network congestion
010	1011	43	Access information discarded
010	1100	44	Requested circuit/channel not available
010	1111	47	Resources unavailable, unspecified
011	0010	50	Requested facility not subscribed
011	0100	52	Outgoing calls barred
011	0110	54	Incoming calls barred
011	1010	58	Bearer capability not presently available
011	1111	63	Service or option not available
100	0001	65	Bearer service not implemented
100	0010	66	Channel type not implemented
100	0101	69	Requested facility not implemented
100	1111	79	Service or option not implemented, unspecified
101	0001	81	Invalid Call Reference value
101	0010	82	Identified channel does not exist
101	0101	85	Invalid digit value for number
101	0110	86	Call having the requested call identity has been cleared
101	1000	88	Incompatible destination
101	1011	91	Transit network does not exist
110	0000	96	Mandatory information element is missing
110	0001	97	Message type nonexistant or not implemented
110	0010	98	Message not compatible with Call state
110	0100	100	Invalid information element contents
110	1111	111	Protocol error, unspecified
111	1111	127	Interworking, unspecified

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Page reference numbers in bold type indicate a reference to a command description.

Symbols

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