Distributed Routing Software

Network Interface Operations Guide

Part Number: AA–QL2BB–TE

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

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Preface

Objectives

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

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

Audience

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

Organization

This manual is organized as follows:

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

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

Associated Digital Documents

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

- *Bridging Configuration Guide,* AA–QL29B–TE
- *Event Logging System Messages Guide,* AA–QL2AB–TE
- *Routing Protocols Reference Guide,* AA–QL2CB–TE
- *Routing Protocols User's Guide,* AA–QL2DB–TE
- *System Software Guide,* AA–QL2EB–TE

Conventions Used in This Guide

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

1

Getting Started with Network Interfaces

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

Network Interfaces and the GWCON Interface Command

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

Accessing Network Interface Configuration Processes

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

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

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

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

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

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

Accessing Network Interface Console Processes

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

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

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

```
+interface
                                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>
```

Accessing Link Layer Protocol Configuration and Console Processes

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

2

Configuring the Ethernet Network Interface

This chapter describes how to configure the Ethernet interface.

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

Ethernet Configuration Commands

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

Table 2–1 Ethernet Configuration Command Summary

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

? (Help)

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

Syntax: ?

Example: **ETH config> ?**

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

Connector-Location

Specify the Ethernet or token ring interface location in your HUB module. Use this command in certain interface configurations where the 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 interfaces configuration (for example, an Ethernet interface is in slot 1) then the **connector-location** command is not visible from the configuration process of that interface.

Syntax: connector-location *location*

Example: **connector–location front**

Connector-Type

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

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

Syntax: connector-type *name*

Example: **connector–type aui**

Frame

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

Table 2–2 NetWare IPX Encapsulation Types

Option	Description	Syntax
Ethernet_II (Ethernet type 8137)	Uses Ethernet type 8137 as the packet format. This format is required if you are using NetWare-VMS on the Ethernet.	frame ethernet_II
Ethernet_8023 (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`**

IP-Encapsulation

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

Syntax: IP-encapsulation *type*

Example: **`IP-encapsulation e`**

List

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

Syntax: list all

Example: **list all**

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

Exit

Return to the previous prompt level.

Syntax: exit

Example: **exit**

3

Monitoring the Ethernet Network Interface

This chapter describes how to monitor the Ethernet interfaces.

Displaying Ethernet Statistics through the Interface Command

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

```
+interface
                                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
```

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.
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.
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.
out of window collisions or late 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.

Accessing the Interface Console Process

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

Ethernet Interface Console Commands

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

Table 3–1 Ethernet Console Command Summary

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

? (Help)

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

Syntax: ?

Example: **ETH> ?**

```
COLLISIONS
EXIT
```

Collisions

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

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

Syntax: collisions

Example: **ETH> coll**

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

Exit

Return to the previous prompt level (GWCON).

Syntax: exit

Example: **ETH> exit**

4

Configuring the FDDI Network Interface

This chapter describes how to configure the FDDI network interface.

Accessing the Interface Configuration Processes

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

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

Network Interfaces and the GWCON Interface Command

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

Basic FDDI Configuration Procedures

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

- Use the **set config** command to indicate the ports the interface uses to transmit and receive.

- Use the **set policy** command to select the FDDI connection types.

- Use the **set station-type** command to set the FDDI station type as single-attach slave or dual-attach peer.

FDDI Configuration Commands

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

Table 4–1 FDDI Configuration Command Summary

Command	Function
? (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
```

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

all

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

Example: **list all**

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

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

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

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

apple-I-OUI

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

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

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

config

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

Example: **list config**

```
Preferred configuration THRU-A
```

max-trt

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

Example: **list max-trt**

```
TMax: 2097152
```

phy a b

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

Example: **list phy a**

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

policy

Displays the valid types of FDDI connections for the interface.

Example: **list policy**

```
Policy = reject no connections
```

req-trt

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

Example: **list req-trt**

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

smt-timer

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

Example: **list smt-timer**

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

station-type

Displays the interface FDDI station type.

Example: **list station-type**

```
Station type: PEER (default)
```

tvx-time

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

Example: **list tvx-time**

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

Set

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

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

appletalk-I-OUI

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

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

config ***interface***

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

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

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

Example: **`set config b-thru`**

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

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

Example: **`set max-trt 2097152`**

notify-timer *#-of-seconds*

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

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

Example: **set notify-timer ?**

```
      SMT Notify time in seconds [65535]?
```

phy ***ring type parameter value***

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

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

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

Router-port-type	Specifies if the router accepts or rejects connections that neighboring nodes cannot support.
Neighbor-node-port-type	Valid port types are • **A** = Primary RCV/Secondary XMT • **B** = Secondary RCV/Primary XMT • **M** = Single attach to a concentrator • **S** = Single attach node

Example: **set policy reject ab**

Table 4–3 FDDI Port Connection Rules

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

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

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

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

Example: **set req-trt 1000000**

station-type *interface-type*

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

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**

5

Monitoring the FDDI Network Interface

This chapter describes how to monitor the FDDI network interface.

FDDI Interfaces and the GWCON Interface Command

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

Statistics Displayed For the FDDI Interface

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

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

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

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

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

```
FDDI interface
PEER Station   Preferred configuration THRU-A
```

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

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

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

```
    Policy = reject no connections
```

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

```
T_Neg = 0x18700 byte clocks = 8.0076 msec, Latency = 0.0038 msec
TVX = 2.621, T_Max = 167.772, T_Req = 8.000 msec
```

Displays the following timer values:

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.

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

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

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

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

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

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:1208, Copied:1291, Not Copied:157
```

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

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

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

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

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

6

Configuring the Frame Relay Interface

This chapter describes the Frame Relay configuration commands.

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

Accessing the Frame Relay Configuration Environment

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

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

Frame Relay Basic Configuration Procedure

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

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

1. **Add the FR device**. You must add the FR device from the `Config>` prompt using the **add device** and the **set datalink frame-relay** commands.

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.

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

Frame Relay Configuration Commands

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

Table 6–1 Frame Relay Configuration Commands Summary

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

Enabling Frame Relay Management

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

1. Enter **enable lmi** at the `FR Config>` prompt to enable all management activity.

2. Enter **set lmi_type** at the `FR Config>` prompt to select the type of management for the interface. Refer to the following table for details of the management types available.

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

Table 6–2 Frame Relay Set Commands Options

Command	Options	Description	Default
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

? (Help)

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

Syntax: ?

Example: **?**

```
ADD
CHANGE
DISABLE
ENABLE
LIST
REMOVE
SET
EXIT
```

Example: **set ?**

```
CLOCKING
CIR-ADJUSTMENT
ENCODING
FRAMESIZE
IDLE
LINE-SPEED
N1-PARAMETER
N2-PARAMETER
N3-PARAMETER
T1-PARAMETER
TRANSMIT DELAY
```

Add

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

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

permanent-virtual-circuit

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

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

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

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

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.
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*.

protocol-address *protocol-name*

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

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

Example: **add protocol-address**

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

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

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

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

Protocol name or number — Defines the name or number of the protocol that you are adding. If you specify an unsupported protocol, the system prompts you with the supported protocols and their numbers:

Prot #	Name
0	IP
4	DN
5	XNS
6	BAN
7	IPX
14	APL

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

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

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

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

Change Permanent-Virtual-Circuit

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

Syntax: change permanent-virtual-circuit

Example: **change permanent-circuit**

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

Circuit Number	Indicates the circuit number in the range of 16 to 1007.
Committed Information Rate	Indicates the committed information rate (CIR) in a range of 300 bps to 2048000 bps. The default is 64000 bps.
Assign circuit Name	Indicates the ASCII character string designation for the circuit that you want to change.

Disable

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

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

cir-monitor

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

Example: **disable cir-monitor**

lmi

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

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

Example: **disable lmi**

multicast-emulation

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

Example: **disable multicast-emulation**

orphan-circuits

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

Example: **disable orphan-circuits**

protocol-broadcast

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

Example: **disable protocol-broadcast**

Enable

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

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

cir-monitor

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

Example: **enable cir-monitor**

enable lmi

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

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

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

Example: **enable lmi**

multicast-emulation

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

Example: **enable multicast-emulation**

orphan-circuits

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

Example: **enable orphan-circuits**

protocol-broadcast

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

Example: **enable protocol-broadcast**

List

Display currently configured management and PVC information.

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

hdlc

Displays Frame Relay HDLC configuration.

Example: **list hdlc**

```
                FRAME RELAY HDLC CONFIGURATION

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

Encoding	Indicates the encoding type: NRZ or NRZI.
Idle	Indicates the idle type configured, either flag or mark.
Cable type	Indicates the cable type configured, either RS-232, RS-423, V.35, V.36, or X.21.
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        = 0
   LMI type    = REV1            LMI Orphans OK  = Yes

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

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

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.
Protocol Broadcast	Indicates whether protocols such as RIP may function over the Frame Relay interface, 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.
CIR monitor adjust	Indicates the maximum burst transmission speed allowed over a PVC when CIR monitoring is enabled. The range is 1 to 100. The maximum burst transmission speed is the configured CIR value times the CIR monitor adjust entry. This value is configured with **set cir-adjustment** command.

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.

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

```
Maximum PVCs Allowable = 64
Total PVCs Configured  = 2

Circuit        Circuit        Circuit        Committed Information
Name           Number          Type             Rate bits/sec

Boston           16           Permanent             2400
Unassigned       20           Permanent             4800
```

Maximum PVCs allowable	Indicates the number of PVCs that can exist for this interface. This number includes any PVCs that you added with the **add permanent-circuit** command and dynamically learned through the management interface.
Total PVCs configured	Indicates the total number of currently configured PVCs for this interface.
Circuit Name	Indicates the ASCII designation of the configured PVC.
Circuit Number	Indicates the number of a currently configured PVC.

Circuit Type	Indicates the type of virtual circuit currently configured. This release of Frame Relay supports only permanent virtual circuits.
Committed Information Rate	Indicates the information rate guaranteed over the interface.

protocol-addresses

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

Example: **list protocol-addresses**

```
   Protocol Type                Protocol Address   Circuit Number

        IP                       128.185.121.10         40
        IP                       128.185.136.43         41
        IP                       128.185.115.70        109

        XNS                      0000c90b234f           34
        XNS                      0000c90b235f           42
        XNS                      0000c90b236f           59

        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.

Remove

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

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

permanent-virtual-circuit *pvc#*

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

Example: **remove permanent-circuit 20**

protocol-address

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

Example: **remove protocol-address**

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

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

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

Protocol	First Prompt	Second Prompt
IP protocol:	`IP Address [0.0.0.0]?`	`Circuit Number [16]?`
IPX protocol:	`Host Number (in hex)[]?`	`Circuit Number [16]?`

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

Prot #	Name
0	IP
4	DN
5	XNS
6	BAN
7	IPX
14	APL

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

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

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

Set

Configure the interface to run the Frame Relay protocol.

Set Command Considerations

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

set n3-parameter 4
set n2-parameter 3

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

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

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

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

cir-adjustment *multiplier*

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

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

Example: **set cir-adjustment**

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

encoding *NRZ* or *NRZI*

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

Example: **set encoding nrz**

frame-size ***value***

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

Example: **set frame-size 2000**

idle ***flag*** **or** ***mark***

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

Example: **set idle flag**

lmi-type ***management type***

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

Table 6–5 Frame Relay Set Commands Options

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. *Time* is the interval in the range of 5 to 30. The default is 2.

Example: **set n1-parameter**

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

n2-parameter *max#*

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

Example: **set n2-parameter**

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

n3-parameter *max#*

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

Example: **set n3-parameter**

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

p1-parameter *max#*

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

Example: **set p1-parameter**

```
Parameter P1 [64]?
```

t1-parameter ***time***

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

Example: **set t1-parameter**

transmit-delay #

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

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

Example: **set transmit 1**

Exit

Return to the Config> prompt.

Syntax: exit

Example: **exit**

7

Monitoring Frame Relay Interfaces

This chapter describes the Frame Relay console commands.

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

Accessing the Frame Relay Console Environment

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

Frame Relay Console Commands

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

Table 7–1 Frame Relay Console Commands Summary

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

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

? (Help)

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

Syntax: ?

Example: **?**

```
Clear
List
Exit
```

Clear

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

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

Syntax: clear

Example: **clear**

List

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

Syntax: list all
circuit
lmi
permanent-virtual-circuit

all

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

Example: **list all**

circuit *pvc#*

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

Example: **list circuit 347**

```
Circuit state       = Active  Circuit is orphan  = No
Frames Transmitted  = 589     Bytes Transmitted  = 18956
Frames Received     = 4563    Bytes received     = 24897
Total FECNS         = 3       Total BECNS        = 1
Times Congested     = 2       Times Inactive     = 1
CIR in bits/sec     = 2400

Xmit frames dropped due to network congestion = 0
Xmit frames dropped due to rate monitoring    = 0
```

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 circuit is a non-configured circuit learned through management.
Frames/Bytes transmitted	Indicates how many frames and bytes this PVC has transmitted.
Frames/Bytes received	Indicates how many frames and bytes that this PVC has received.
Frames dropped	Indicates the number of frames that this PVC has dropped.
Total FECNS	Indicates the number of times that this PVC was notified of inbound or downstream congestion.
Total BECNS	Indicates the number of times that this PVC was notified of outbound or upstream congestion.
Times congested	Indicates the number of times that this PVC is congested.
Times inactive	Indicates the number of times that this PVC was inoperable.
CIR in bits/sec	Indicates the information rate of the PVC in the range of 300 bps to 2048000 bps.

lmi

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

Example: **list lmi**

```
Management Status:

LMI enabled   = Yes          LMI DLCI                      = 0
LMI type      = ANSI         LMI Orphans OK                = Yes
LMI seq interval seconds                                   = 3

Protocol broadcast   = Yes
Emulate multicast    = Yes    CIR monitoring               = No
PVCs allowed         = 64     Interface MTU bytes          = 2048
Line access rate bps = 256000 CIR monitor adjust           = 1
Timer T1 seconds     = 10     Counter N1 increments        = 2
LMI N2 threshold     =  3     LMI N3 error threshold window = 4

Current receive sequence  = 165
Current transmit sequence = 30
Total status enquiries    = 7 Total status responses       = 23
Total sequence requests   = 16 Total responses             = 23
      PVC Status:

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

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.

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.
CIR monitor adjust	Indicates the information rate value that is used to calculate the burst rate above the configured CIR when CIR monitoring is enabled.
Timer T1 seconds	Indicates the rate that the frame relay interface performs a sequence number exchange with management.
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.
Total PVC allowed	Indicates the number of allowable PVCs (including orphans) for use with this interface.
Total PVC configured	Indicates the total number of currently configured PVCs for this interface.
Total PVC active	Indicates the number of active PVCs on this interface.
Total PVC congested	Indicates the number of PVCs that are throttled down because of congestion within the network.
Total PVC left net	Indicates the total number of PVCs that are no longer on the network.
Total PVC 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**

```
                Circuit   Orphan    Type/     Frames     Frames
Circuit#         Name     Circuit   State  Transmitted  Received
    16        Unassigned    No       A        7782        1924
    20         Boston       Yes      A         589        4563

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

Circuit#	Indicates the number of the PVC.
Orphan Circuit	Indicates whether the PVC is a nonconfigured circuit (yes or no).
State	Indicates the state of the circuit: A (active), I (inactive), P (Permanent), M (Multicast). or C (congested).

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

Exit

Return to the previous prompt level.

Syntax: exit

Example: **exit**

Frame Relay Interfaces and the GWCON Interface Command

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

Statistics Displayed For Frame Relay Interfaces

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

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

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

 Adapter cable:          RS232  RISC Microcode Revision:            2

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

 Line speed:             unknown
 Last port reset:        15 seconds ago

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

The fields in the previous examples are explained below.

Nt	Global network number.
Nt'	Global network prime number.
Interface	Interface name and its instance number.
CSR	Command and status register addresses.
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	Type of cable.
RISC Microcode Revision	Microcode revision level.
Line speed:	External clocking rate.
Last port reset:	Number of seconds since last port reset.

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 (> 2062 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 transmit device was ready.

8

Configuring Point-to-Point Protocol Interfaces

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

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

Accessing the Interface Configuration Process

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

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

Point-to-Point Configuration Commands

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

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

Command	Function
? (Help)	Displays all the Point-to-Point commands or lists the options for specific commands.
List	Lists all information related to the point-to-point interfaces protocols, parameters, and options.
Set	Sets HDLC parameters, LCP options and parameters, IPCP options, BNCP options, and NCP parameters.
Exit	Exits the PPP configuration process and returns to the `Config>` prompt.

Help (?)

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

Syntax: ?

Example: **?**

```
LIST
SET
EXIT
```

Example: **list ?**

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

List

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

Syntax: list all
bncp
hdlc
ipcp
lcp
parameters

all

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

Example: **list all**

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

Transmit Delay Counter: 0

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

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

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

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

Note: This example shows all possible options and parameters.

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

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

bncp

Lists the Bridging Network control protocol options.

Example: **list bncp**

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

BNCP Options

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

hdlc

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

Example: **list hdlc**

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

Transmit Delay Counter:  0
```

ipcp

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

Example: **list ipcp**

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

lcp

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

Example: **list lcp**

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

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

parameters

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

Example: **list parameters**

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

Set

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

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

Syntax: set
- bncp
- hdlc encoding . . .
- hdlc idle . . .
- hdlc transmit delay . . .
- ipcp . . .
- lcp . . .
- parameters . . .
- hdlc cable . . .

bncp

Sets Bridging Network Control Protocol (BNCP) parameters.

Example: **set bncp**

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

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

hdlc encoding *NRZ* or *NRZI*

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

Example: **set hdlc encoding nrz**

hdlc idle *flag* or *mark*

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

Example: **set hdlc idle flag**

hdlc transmit-delay *microseconds*

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

Example: **set hdlc transmit-delay 30**

ipcp

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

Example: **set ipcp**

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

IPCP compression	Selects whether or not the PPP handler accepts compressed data. PPP supports Van Jacobson Compressed TCP/IP (RFC 1144). Enable this option when the point-to-point link is running at a low baud rate. Setting this value to Yes enables compression. Setting this value to No disables compression. The default is No.
Send our IP address	Specifies whether or not to send the local IP address to the remote end of the link. Set this option to Yes if the other end of the link requires the IP address. In either case, the PPP software sends the local IP address if the other end of the link requests it.
Request their IP address	Specifies whether or not to request the IP address from the remote end of the link. If the PPP software receives the remote IP address, it displays the address with the PPP monitoring statistics.

lcp *options* or *parameters*

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

Example: **set lcp options**

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

Maximum receive unit	Sets the maximum packet size of the information field that can be transferred in a single datagram. The range is 576 to 4089 bytes. The default is 2048.
Magic number	Specifies whether or not the magic number option is enabled. Magic number provides a way to detect looped-back links in serial line configurations. When this option is enabled, the link uses the system clock as a random number generator. When the LCP receives a Configure-Request with a magic number present (the magic number option is enabled), it compares the received magic number with the magic number in the last Configure-Request sent to the peer. If the two magic numbers are different, the link is not considered looped back. If the two magic numbers are the same, the PPP handler attempts to bring the link down and up again to renegotiate magic numbers. Setting this value to Yes enables the magic number option. Setting this value to No disables the option. The default is Yes.

Example: **set lcp parameters**

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

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.
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.

parameters

Sets parameters for all Network Control Protocols.

Example: **set parameters**

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

Config tries — Sets the number of configure-request packets that NCP sends to a peer station to attempt to open a PPP link. The range is 1 to 100. The default is 20.

This action indicates the desire to open an LCP connection with a specified set of configuration options. The retry timer starts after a configure-request packet is transmitted. This is done to guard against packet loss.

NAK tries — Sets the number of configure-nak (nak = not acknowledged) packets that NCP sends to a peer station while attempting open a PPP link. The range is 1 to 100. The default value is 10.

Upon receiving configure-request packets with some unacceptable configuration options, NCP sends configure-nak packets. These packets are sent to refuse the offered configuration options and to suggest modified, acceptable values.

Terminate tries	Sets the number of terminate-request packets that NCP sends to a peer station to close a PPP link. The range is 1 to 100. The default value is 10. This action indicates the desire to close an NCP connection. The retry timer is started after a terminate-request packet is transmitted. This is done to guard against packet loss.
Retry timer	Sets the amount of time, in milliseconds, that elapses before NCP's transmission of configure-request (to open the link) and terminate-request (to close the link) packets is timed out. Expiration of this timer causes a timeout and the halting of configure-request and terminate-request packet transmission. The range is 200 to 30000 milliseconds. The default is 3000 milliseconds.

Exit

Return to the `Config>` prompt.

Syntax: exit

Example: **exit**

9

Monitoring Point-to-Point Protocol Interfaces

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

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

Accessing the Interface Console Process

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

Point-to-Point Console Commands

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

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

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

? (Help)

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

Syntax: ?

Example: **?**

```
CLEAR
LIST
EXIT
```

Example: **list ?**

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

Clear

Clear all statistics from point-to-point interfaces.

Syntax: clear

Example: **clear**

List

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

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

all

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

Example: **list all**

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

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

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

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

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

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

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

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

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

OSICP State:          Closed
```

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ap2

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

Example: **list ap2**

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

atcp

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

Example: **list atcp**

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

bncp

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

Example: **list bncp**

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

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

Lists information and counters related to the specified control protocol.

Example: **list control lcp**

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

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

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

- **Open** – Indicates that a connection was made and data can be sent. The retry timer does not run in this state.
- **Closed** – Indicates that the link is down and there is no attempt being made to open it. In this state, all connection requests from peers are rejected.
- **Listen** – Indicates that the link is down and there is no attempt being made to open it. In contrast to the CLOSED state, however, all connection requests from peers are accepted.

- **Request-Sent** – Indicates that an active attempt is being made to open the link. A Configure-request packet was sent but a Configure-Ack was not yet received nor was one sent. The retry timer is running at this time.
- **Ack-Received** – Indicates that a Configure-request packet was sent and a Configure-Ack packet was received. The retry timer is still running since a Configure-Ack packet was not transmitted.
- **Ack-Sent** – Indicates that a Configure-Ack packet and a Configure-request packet were sent but a Configure-Ack packet was not received. The retry timer always runs in this state.
- **Closing** – Indicates that an attempt is being made to close the connection. A Terminate-request packet was sent but a Terminate-Ack packet was not received. The retry timer is running in this state.

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

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

LCP Option

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

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

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

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

Protocol compression	Not currently supported. PPP rejects this option if it is received.
Address/ Control compression	Not currently supported. PPP rejects this option if it is received.
32-bit checksum	Not currently supported. PPP rejects this option if it is received.

Example: **list control 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 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 ipxcp**

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

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

Example: **list control bncp**

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

BNCP Option            Local                    Remote
-----------            -----                    ------

Tinygram Compression   DISABLED                 DISABLED

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

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

BNCP Option

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 atcp**

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

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

AppleTalk Address Info

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

Example: **list control osicp**

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

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

dn

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

Example: **list dn**

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

dncp

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

Example: **list 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.

ip

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

Example: **list ip**

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

Ip Statistic

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

ipcp

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

Example: **list ipcp**

```
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                -
```

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.
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.

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                    -
```

Exit

Return to the CGWCON prompt (+).

Syntax: exit

Example: **exit**

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

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

Example: **interface 2**

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

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

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

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

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

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

The following table describes the output.

Nt	Indicates the serial line interface number.
Nt'	Indicates the serial line interface number.
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 (>nnnn 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.

Example: **+ interface 1**

```
                                Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec     Passed     Failed       Failed
1  1   PPP/0      1001620   5D          1        705            0

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

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

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

  Line speed:              unknown
  Last port reset:         18 minutes, 19 seconds ago

  Input frame errors:
   CRC error                    0   alignment (byte length)           2
   missed frame                 0   too long (>  2182 bytes)          0
   aborted frame                0   DMA/FIFO overrun                  0
   L & F bits not set           0
  Output frame counters:
   DMA/FIFO underrun errors     0   Output aborts sent                0
```

10

Configuring SDLC Interfaces

This chapter describes the SDLC configuration commands.

For more information on the SDLC protocol, refer to the *Bridging Router Reference Guide.*

Accessing the SDLC Configuration Environment

For information about accessing the SDLC configuration environment, refer to Chapter 1 in the *System Software Guide*.

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

Basic Configuration Procedure

This section outlines the minimal configuration required to get the DLSw protocol up and running. To fully enable DLSw, you need to configure IP, ASRT, DLSw, and SDLC. Before beginning any configuration procedure, use the **list device** command from the **config** process to list the interface numbers of different devices. At the **config** prompt, select the interface you want to configure by entering either:

```
config>network <interface number>

   or

config>n <interface number>.
```

SDLC Configuration Requirements

In addition to the SDLC-specific configuration procedures and commands described in this chapter, you need to configure SDLC in the DLSw protocol.

SDLC Configuration Commands

The SDLC configuration commands allow you to create or modify the SDLC interface configuration. This section summarizes and explains the SDLC configuration commands. Enter all the SDLC configuration commands at the SDLC prompt `SDLC Config>` within the network configuration console. Defaults for any command and its parameters are enclosed in brackets immediately following the prompt. Table 10–1 lists SDLC configuration commands and their function.

Table 10–1 SDLC Configuration Commands Summary

Command	Function
? (Help)	Lists the configuration commands or lists any parameters associated with that command.
Add	Adds an SDLC remote-secondary link station.
Delete	Removes an SDLC remote-secondary link station.
Disable	Prevents connections to one of the SDLC link stations.
Enable	Allows connections to one of the SDLC link stations.
List	Displays configured information for one of the SDLC link stations.
Set	Configures specific interface and remote-secondary information.
Exit	Exits the `SDLC config>` process.

? (Help)

List the available 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: **?**

```
ADD
DISABLE
DELETE
ENABLE
LIST
EXIT
```

Add

Add a remote-secondary end station. You may elect not to use this command. By default, the router adds a remote-secondary end station to ensure proper operation of the SDLC interface. The bridging router is considered the primary end station by default.

Syntax: add remote-secondary

Example: **add remote-secondary**

```
Enter station address (in hex) [C3]?
Enter remote station name [SDLC_C3]?
Enter max packet size [2009]?
Enter receive window [7]?
Enter transmit window [7]?
```

Enter station address	The remote station's SDLC address in the range 01 – FE.
Enter remote station name	The name designation of the SDLC station (maximum characters is 8).
Enter max packet size	The maximum packet size that can be sent to or received from the remote link station. This value cannot be greater than that specified for the link. This value is configured with the **set link frame-size** command.
Enter receive window	The maximum number of packets that the bridging router can receive without sending a response.
Enter transmit window	The maximum number of packets that the bridging router can transmit without receiving a response.

Delete

Remove the specified remote-secondary end station (remote station name or address) from the SDLC configuration. The bridging router is considered the primary end station (default).

Syntax: delete remote-secondary name or *address*

Example: **delete remote-secondary C1**

Disable

Prevent connections from being created with a SDLC link station.

Syntax: disable link
remote-secondary . . .

link

Prevents the transmitting and receiving of data to all configured SDLC link stations on the interface.

Example: **disable link**

remote-secondary *name* or *address*

Prevents the transmitting and receiving of data to the specified secondary-remote end station (remote station name or address).

Example: **disable remote-secondary c1**

Enable

Enable connections to remote SDLC link stations.

Syntax: enable link
remote-secondary . . .

link

Allows subsystems in the router (for example, DLSw) to use SDLC's facilities.

Example: **enable link**

remote-secondary *name* or *address*

Allows connections to the specified secondary-remote end station (link station name).

Example: **enable remote-secondary C1**

List

Display configuration information on one or all SDLC link stations.

Syntax: list link
remote-secondary . . .

link

Displays information for all configured SDLC link stations on the interface.

Example: **list link**

```
Link configuration for: LINK_0   (ENABLED)
Role:          PRIMARY        Type:          POINT-TO-POINT
Duplex:        FULL           Modulo:        8
Idle State:    FLAG           Encoding:      NRZ
Timers:        XID/TEST response:            0.5 sec
               SNRM response: 2.0 sec
               Poll response: 0.5 sec
               Inter-poll delay:             0.2 sec
               RTS hold delay:               0.0 sec
               Inter-frame delay:            DISABLED
Counters:      XID/TEST retry:               4
               SNRM retry:                   6
               Poll retry:                   10
```

Link configuration	The name and status of SDLC link station that are in the bridging router's configuration.
Role	The designation of the link station, PRIMARY or NEGOTIABLE. Even if NEGOTIABLE is specified, the router negotiates it to be PRIMARY.
Type	The type of link: MULTIPOINT or POINT-TO-POINT.

Duplex	Duplex configuration” HALF or FULL.
Modulo	The sequence number range to use on the link: MOD 8 (0–7) or MOD 128 (0 – 127).
Idle state	The bit pattern (FLAG or MARK) transmitted on the line when the interface is not transmitting data.
Encoding	Configures the SDLC transmission encoding scheme as NRZ (Non-Return to Zero) or NRZI (Non-Return to Zero Inverted).
Frame Size	The maximum frame size that can be sent over the interface.
Timers:	All the timers listed below have a 100ms resolution.
XID/TEST resp.	The time to wait for an XID or TEST response message before retransmitting the XID or TEST frame. A value of 0 indicates that the router continues to retry indefinitely.
SNRM(E) response	The maximum time to wait for an UA response message before the station retransmits SNRM(E).
Poll response	The maximum time to wait for a response from any polled station before retrying.
Inter-poll delay	The amount of time the bridging router (configured with a primary role) waits after receiving a response, before polling the next station.
RTS hold delay	The amount of time that the primary bridging router waits before dropping RTS low after the transmission of a frame. The RTS hold delay parameter is specific to half-duplex operation.
Inter-frame delay	The minimum amount of time (in 5.12 micro-second time units) that the primary bridging router waits between transmitting frames.
Counters:	

XID/TEST retry	The maximum number of times the bridging router sends an XID or TEST frame without receiving a response before timing out. A value of 0 indicates that the router continues to retry.
SNRM	The maximum number of times the bridging router sends an SNRM(E) frame without receiving a response before timing out. A value of 0 indicates that the router continues to retry.
Poll retry	The maximum number of times the bridging router polls the station without receiving a response before timing out. A value of 0 indicates that the router continues to retry indefinitely.

remote-secondary *all* or *address* or *link station name*

Displays information for the specified SDLC link station on the interface.

Example: **list remote-secondary all**

```
Address   Name     Status   Max BTU   Rx Window  Tx Window
  C1    SDLC_C1    Enabled    2005        7          7
  C2    SDLC_C2    Disabled   2005        7          7
  C3    SDLC_C3    Enabled    2009        7          7
```

Example: **list remote-secondary C2**

```
Address   Name     Status   Max BTU   Rx Window  Tx Window
  C2    SDLC_C2    Disabled   2005        7          7
```

Address	The address of the SDLC link station.
Name	The character string name designation of SDLC link station.
Status	The status of the SDLC link station, ENABLED or DISABLED.
Max BTU	The frame size limit of the remote station. This frame size must not be larger than the maximum Basic Transmission Unit (BTU) packet size configured with the **set link frame-size** command. The default is 521 bytes.

Rx Window	The size of the receive window.
Tx Window	The size of the transmit window.

Set

Configure specific information for one SDLC link station.

Syntax: set
- link duplex . . .
- link encoding . . .
- link frame-size
- link idle . . .
- link modulo . . .
- link name
- link poll . . .
- link role . . .
- link rts-hold
- link snrm(e)
- link transmit-delay
- link type . . .
- link xid/test
- remote-secondary . . .

link duplex *full* or *half*

Configures the SDLC line for full-duplex or half-duplex.

Example: **set link duplex full**

link encoding n*rz* or *nrzi*

Configures the SDLC transmission encoding scheme as NRZ (Non-Return to Zero) or NRZI (Non-Return to Zero Inverted). NRZ is the default.

Example: **set link encoding nrz**

link *frame-size*

Configures the maximum size of the frames that can be transmitted and received on the data link. The valid entries are from 576 to 18000. The default is 2048.

Example: **set link frame-size**

```
Frame size in bytes (576 – 18000) [2048]?
```

link idle *flag*

Configures the transmit idle state for SDLC framing. The default is the *flag* option which provides continuous flags (7E hex) between frames.

Example: **set link idle flag**

The link receives a flag idle transparently.

link idle *mark*

Configures the transmit idle state for SDLC framing. The *mark* option puts the line in a marking state (OFF, 1) between frames.

Example: **set link idle mark**

The link receives a mask idle.

link modulo *8* or *128*

Specifies the sequence number range to use on the link: MOD 8 (0–7) or MOD 128 (0–127). Default is 8.

Note: When you change this value, the window sizes become invalid. Use the **set remote-secondary** command to change the receive-window and transmit-window sizes. Valid window sizes for mod 8 are 0 through 7, and 8 through 127 for mod 128.

Also, at connection start–up, a SNRME rather than a SNRM is used and supervisory frame headers as well as i–frame headers are expanded by an additional byte.

Example: **set link modulo 8**

link name

Establishes a character string for the link that you are configuring. This parameter is for informational purposes only.

Example: **set link name**

```
Enter link name: [LINK_0]?
```

link poll *delay*

Configures the following poll information:

delay	Configures the time delay between each poll that is sent over the interface.

Example: **set link poll delay**

```
Enter delay between polls [0.2]?
```

link poll *retry*

Configures the following poll information:

retry	Configures the number of times the interface retries to poll the remote SDLC link station before it decides the link station is down and closes the connection.

Example: **set link poll retry**

link poll *timeout*

Configures the following poll information:

timeout	Configures the amount of time the bridging router waits for a poll response before timing out.

Example: **set link poll timeout**

```
Enter delay between polls [0.2]?
```

link role *primary* or *negotiable*

Configures the interface as an SDLC primary link station (default).

Note: The SDLC interface negotiates only to primary. It does not negotiate to secondary.

Example: **set link role primary**

link rts-hold

The time to hold RTS high after transmitting a frame. This setting is for half-duplex mode. This setting has no effect in full-duplex mode.

Example: **set link rts-hold**

```
Enter RTS hold duration after transmit complete [0.0]?
```

link snrm *timeout* or *retry*

Configure the following SNRM(E) information:

timeout	Waiting time for a UA response before retransmitting an SNRM(E).
retry	Number of times to retransmit an SNRM(E) without receiving a response before giving up.

Example: **set link snrm timeout**

```
Enter SNRM response timeout [2.0]?
Internal Clock Speed [0]?
```

link transmit-delay *<value>*

Allows the insertion of a delay between transmitted packets (521 microseconds). This command ensures a minimum delay between frames so that it is compatible with older, slower serial devices at the other end. This value is passed in 5.12 microsecond units.

Example: **set link transmit-delay 6**

link type *multipoint* or *point-to-point*

Configures the SDLC link to either a multipoint link or a point-to-point link.

Example: **set link type multipoint**

link xid/test *timeout* or *retry*

Configures the following XID/test information:

timeout	Maximum amount of time to wait for an XID or TEST frame response.
retry	Maximum number of times an XID or TEST frame is resent before giving up.

Example: **set link test timeout 10**

remote-secondary ***address*** ***<argument>***

Changes the remote station's SDLC address in the range 02 to FE.

Example: **set remote-secondary c1 address CE**

remote-secondary ***max-packet*** ***<argument>***

The maximum size of the packet that a remote-secondary station can receive. If this frame size is larger than the maximum packet size configured with the **set link frame-size** command, the software adjusts it downward to the value of frame-size. The bridging router generates an ELS message warning the user that this value is changed. The user continues receiving this ELS message until it is changed in the SRAM configuration. The default is 521 bytes.

Example: **set remote-secondary c2 max–packet 521**

remote-secondary ***name*** ***<argument>***

The name designation of the SDLC station.

Example: **set remote-secondary c1 name Brad**

remote-secondary ***receive-window*** ***<argument>***

The maximum number of frames that can be received by the bridging router before sending a response.

Example: **set remote-secondary c1 receive–window 4**

remote-secondary ***transmit-window*** ***<argument>***

The maximum number of frames that the bridging router can transmit before receiving a response frame.

Example: **set remote-secondary c1 transmit–window 6**

Exit

Return to the previous prompt level.

Syntax: exit

Example: **exit**

11

Monitoring the SDLC Interface

This chapter describes the SDLC console commands. Some of these commands are identical to those in the `SDLC config>` process, and they allow you to dynamically configure the SDLC interface without permanently affecting the SRAM configuration.

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

Accessing the SDLC Console Environment

For information on how to access the SDLC console environment, refer to Chapter 1 in the *System Software Guide*.

SDLC Console Commands

This section summarizes and then explains the SDLC console and related commands. Use these commands to gather information from the database.

Table 11–1 lists SDLC console commands and their function.

Table 11–1 SDLC Console Commands Summary

Command	Function
? (Help)	Displays all the SDLC console commands (clear and list) or any options associated with those commands.
Add	Adds an SDLC remote-link station.
Clear	Clears the counters on the SDLC interface.
Delete	Dynamically removes an SDLC remote-secondary link station.
Disable	Disables connections to one SDLC link station.
Enable	Enables connections to one SDLC link station.
List	Displays statistics on one or all SDLC link stations.
Set	Configures specific interface and remote-secondary information.
Test	Tests the link between the bridging router and the SDLC link station.
Exit	Exits the SDLC console 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: **?**

```
SET
ADD
CLEAR
DELETE
DISABLE
ENABLE
LIST
TEST
EXIT
```

Add

Add a remote-secondary end station. You may elect not to use this command, and by default, the router adds a remote-secondary end station to ensure proper operation of the SDLC interface. The bridging router is considered the primary end station.

Syntax: add remote-secondary

Example: **add remote-secondary**

```
Enter station address (in hex) [C3]?
Enter remote station name [SDLC_C3]?
Enter max packet size [2009]?
Enter receive window [7]?
Enter transmit window [7]?
```

Enter station address	The remote station's SDLC address in the range 01 – FE.
Enter remote station name	The name designation of the SDLC station.
Enter max packet size	The maximum packet size that can be sent to or received from the remote link station. This value cannot be greater than that specified for the link. (This value is configured with the **set link frame–size** command.)
Enter receive window	The maximum number of packets that the bridging router can receive without sending a response.
Enter transmit window	The maximum number of packets that the bridging router can transmit without receiving a response.

Clear Counters

Remove all statistics on the SDLC counters for the link station or the remote-secondary station.

Syntax: clear link
remote-secondary

Example: **clear link**

clear remote-secondary

Delete

Terminate an existing SDLC connection without affecting the SDLC configuration in SRAM. The bridging router is considered the primary end station by default. Only disabled remote-secondaries can be deleted. You can do this using the **disable remote–secondary** command.

Syntax: delete remote-secondary *name* or *address*

Example: **`delete remote-secondary SDLC_C4`**

Disable

Disable connection establishment on one or all SDLC link stations without affecting the SDLC configuration in SRAM. The **disable** command also terminates any existing connection to the station.

Syntax: disable link
remote-secondary . . .

link

Prevents connection on all configured SDLC link stations on the interface by terminating all connections.

Example: **`disable link`**

remote-secondary *name* or *address*

Prevents connection to the specified remote-secondary end station (link station name) by terminating any existing connection.

Example: **`disable remote-secondary C1`**

Enable

Enable connection establishment with one or all SDLC link stations without affecting the SDLC configuration SRAM.

Syntax: enable link
remote-secondary . . .

link

Allows connections to be created on all configured SDLC link stations on the interface.

Example: **enable link**

remote-secondary *name* or *address*

Enable connection establishment with the specified remote-secondary end station (link station name).

Example: **enable remote-secondary sdlc_c1**

enable remote-secondary c1

List

Display statistics specific to the data link layer and the interface.

Syntax: list link configuration
link counters
remote-secondary . . .

link configuration

Displays information for all configured SDLC link stations on the interface.

Example: **list link configuration**

```
Link configuration for: LINK_0   (ENABLED)

Role:          PRIMARY        Type:          POINT-TO-POINT
DupleX:        FULL           Modulo:        8
Idle state:    FLAG           Encoding:      NRZ
Clocking:      EXTERNAL       Frame Size:    2048
Speed:         0
Cable:         V.35 DTE

Timers:        XID/TEST response:            0.5 sec
               SNRM response: 2.0 sec
               Poll response: 0.5 sec
               Inter-poll delay:             0.2 sec
               RTS hold delay:               0.0 sec
               Inter-frame delay:            DISABLED

Counters:      XID/TEST retry:               4
               SNRM retry:                   6
               Poll retry:                   10
```

Link configuration for	The name and status of SDLC link stations that are in the bridging router's configuration.
Role	The designation of the link station: PRIMARY or NEGOTIABLE.
Type	The type of link: MULTIPOINT or POINT-TO-POINT.
Duplex	Duplex configuration, HALF or FULL.
Modulo	The sequence number range to use on the link: MOD 8 (0–7) or MOD 128 (0 – 127).
Idle state	The bit pattern (FLAG or MARK) transmitted on the line when the interface is not transmitting data.
Encoding	Data encoding, Non-Return to Zero (NRZ) or Non-Return to Zero Interval (NRZI).
Clocking	Interface clocking: EXTERNAL, INTERNAL, or MIXED.

Frame Size	The maximum frame size that can be sent over the interface.
Speed	The rate generated on the transmit or receive clock lines in DCE mode.
Timers:	All the timers listed below have a 100ms resolution.
XID/TEST resp.	The time to wait for an XID or TEST response message before retransmitting the XID or TEST frame.
SNRM(E) response	The maximum time to wait for an UA response message before the station retransmits SNRM*(E)*.
Poll response	The maximum time to wait for a response from any polled station before retrying.
Inter-poll delay	The amount of time the bridging router waits before polling the next station.
RTS hold delay	The amount of time that the bridging router waits before dropping RTS low after the transmission of a frame. The RTS hold delay is specific to half-duplex operation.
Inter-frame delay	The minimum amount of time (in 5.12 micro-second time units) the bridging router waits between transmitting frames.
Counters:	
XID/TEST retry	The maximum number of times the bridging router sends an XID or TEST frame without receiving a response before timing out. A value of 0 indicates that the router retries forever.

SNRM retry	The maximum number of times the bridging router sends an SNRM*(E)* frame without receiving a response before timing out. A value of 0 indicates that the router retries forever.
Poll retry	The maximum number of times the bridging router polls the station without receiving a response before timing out. A value of 0 indicates that the router retries forever.

link counters

Displays information for the SDLC counters since the last bridging router restart or the last clear counters.

Example: **list link counters**

```
        I-Frames    I-Bytes    Re-Xmit    UI-Frames    UI-Bytes
Send       0          0          0          0            0
Recv       0          0                     0            0

         RR          RNR        REJ
Send      0           0          0
Recv      0           0          0
```

I-Frames	Total number of Information frames received and sent.
I-Bytes	Total number of Information bytes received and sent.
Re-Xmit	Total number of frames that were retransmitted.
UI-Frames	Total number of Unnumbered Information frames received and transmitted.
UI-Bytes	Total number of Unnumbered Information bytes received and transmitted.
RR	Total number RRs (Receive Ready) received and transmitted.
RNR	Total number RNRs (Receive Not Ready) received and transmitted.
REJ	Total number of Rejects received and transmitted.

remote-secondary *all* or *address* or *link station name*

Displays information for the specified SDLC link station (link station name) on the interface.

Example: **list remote-secondary all**

```
Address   Name    Status    Max BTU   Rx Window  Tx Window
  A0    SDLC_A0  Discnected   2009        7          7
  C1    SDLC_C1    Idle       2005        7          7
  C2    SDLC_C2   Disabled    2005        7          7
  C3    SDLC_C3   Enabled     2009        7          7
```

Example: **list remote-secondary C2**

```
Address   Name     Status   Max BTU   Rx Window  Tx Window
  C2    SDLC_C2    Disabled   2005        7          7
```

Address — The address of the SDLC link station.

Name — The character string name designation of SDLC link station.

Status — The status of the SDLC link station:

Enabled	Enabled, but not allocated.
Idle	Allocated, but not used yet
Connected	Connected
Discnected	Disconnected
Connection	Connection establishment in progress.
Discnectng	Disconnection in progress
Recovering	Attempting to recover from a temporary data link error.

Max BTU — The frame size limit of the remote station. This frame size must not be larger than the maximum Basic Transmission Unit (BTU) packet size configured with the **set link frame-size** command. The default is 521 bytes.

Rx Window — The size of the receive window.

Tx Window — The size of the transmit window.

remote-secondary {name or *address*} counters

Displays frame transmit and receive counts for the specified remote secondary station.

Example: **list remote c1 counters**

```
Counters for: SDLC_C1 , address C1 (ENABLED)
     I-Frames    I-Bytes     Re-Xmit   UI-Frames     UI-Bytes  XID–Frames
     --------    -------    --------   ---------     --------  ----------
Send      569      88870           0           0            0           0
Recv      345       4804           0           0            0           0

           RR        RNR         REJ          TEST        SNRM        DISC
      --------   -------    --------    ---------   --------  ----------
Send      4779         0           0            1           1           0
Recv      4443         0           0            1           0           0

           UA         DM       FRMR
      ---------      -------   --------
Send         0          0         0
Recv         1          0         0
```

I-Frames	The total number of Information frames received and sent.
I-Bytes	The total number of Information bytes received and sent.
Re-Xmit	The total number of frames retransmitted.
UI-Frames	The total number of Unnumbered Information frames received and transmitted.
UI-Bytes	The total number of Unnumbered Information bytes received and transmitted.
XID-Frames	The total number of Exchange Identification frames received and transmitted.
RR	The total number of Receive Ready frames received and transmitted.
RNR	The total number of Receive Not Ready frames received and transmitted.
REJ	The total number of Rejects received and transmitted.

TEST	The total number of Test frames received and transmitted.
SNRM	The total number of Set Normal Response Mode frames received and transmitted.
DISC	The total number of Disconnect frames received and transmitted.
UA	The total number of Unnumbered Acknowledgment frames received and transmitted.
DM	The total number of Disconnected Mode frames received and transmitted.
FRMR	The total number of Frame Reject frames received and transmitted.

Set

Dynamically configure specific information for one or all SDLC link stations without affecting the SRAM configuration. The **set** command can be executed only on disabled stations. The **set link** command can be executed only on a disabled link. All time values are entered in seconds, with a 0.1 second resolution.

Syntax: set
- link modulo . . .
- link name
- link poll . . .
- link role . . .
- link rts-hold
- link snrm(e)
- link type . . .
- link xid/test
- remote-secondary . . .

link modulo

Dynamically changes the range of sequence numbers to be used on the data link without affecting the SRAM configuration. Modulo 8 specifies a sequence number range of 0 – 7, and modulo 128 specifies 0 – 127. Default is 8.

Note: When you change this value, the window sizes become invalid. Use the **set remote-secondary** command to change the receive-window and transmit-window sizes. Valid window sizes for mod 8 are 0 – 7, and 8 – 127 for mod 128.

Example: **set link modulo 8**

link name

Dynamically changes the name of the link without affecting the SRAM configuration. A maximum of 8 characters may be entered. This parameter is for informational purposes only.

Example: **set link name**

```
Enter link name: [LINK_0]?
```

link poll *delay* or *timeout* or *retry*

Dynamically changes the following poll information without affecting the SRAM configuration.

delay	Configures the delay between each poll that is sent over the interface.
timeout	Configures the amount of time the bridging router waits for a poll response before timing out.
retry	Configures the number of times the interface retries to poll the remote SDLC link station before it decides the link station is down and closes the connection.

Example: **set link poll delay**

```
Enter delay between polls [0.2]?
```

link role *primary* or *negotiable*

Dynamically configures the interface as an SDLC primary link station (default) or the role of the interface is negotiated between the interface without affecting the SRAM configuration.

Note: The SDLC interface negotiates only to primary. It does not negotiate to secondary.

Example: **set link role primary**

link rts-hold

Dynamically changes the time to hold RTS high after transmitting a frame without affecting the SRAM configuration. This setting is for half-duplex mode. This setting has no effect in full-duplex mode.

Example: **set link rts-hold**

```
Enter RTS hold duration after transmit complete [0.0]?
```

link snrm(e) *timeout* or *retry*

Dynamically changes the following SNRM(E) information without affecting the SRAM configuration.

timeout	The time to wait for a Unnumbered Acknowledgements (UA) response before retransmitting an SNRM(E).
retry	The number of times to retransmit an SNRM(E) without receiving a response before giving up.

Example: **set link snrm timeout**

```
Enter SNRM response timeout [2.0]?
```

link type *multipoint* or *point-to-point*

Dynamically changes the SDLC link to either a multipoint link or a point-to-point link without affecting the SRAM configuration.

Example: **set link type multipoint**

link xid/test *timeout* or *retry*

Dynamically changes the following XID/test information without affecting the SRAM configuration.

timeout	The maximum amount of time to wait for an XID or TEST frame response.
retry	The maximum number of times an XID or TEST frame is resent before giving up.

Example: **set link xid/test timeout 10**

remote-secondary ***address*** ***<argument>***

The remote station's SDLC address in the range 02 – FE.

Example: **set remote-secondary C1 address CE**

remote-secondary ***max-packet*** ***<argument>***

The maximum size of the packet that a remote-secondary station can receive. If this frame size is larger than the maximum packet size configured with the **set link frame-size** command, the software adjusts it downward to the value of frame-size. The bridging router generates an ELS message warning the user that this value is changed. The user continues receiving this ELS message until it is changed in the SRAM configuration. The default is 521 bytes.

Example: **set remote-secondary fred max–packet 521**

remote-secondary ***name*** ***<argument>***

The name designation of the SDLC station. A maximum of 8 characters may be entered.

Example: **set remote-secondary c1 name Brad**

remote-secondary ***receive-window*** ***<argument>***

The maximum number of frames that can be received by the bridging router before sending a response.

Example: **set remote-secondary C1 receive–window 4**

remote-secondary ***transmit-window*** ***<argument>***

The maximum number of frames that the bridging router can transmit before receiving a response frame.

Example: **set remote-secondary c1 transmit–window 6**

Test

Transmit a specified number of TEST frames to the specified remote-secondary link station and waits for a response. Use this command to test the integrity of the connection.

Note: Disable the specified link station before using this command.

Syntax: test remote *<name or address> #frames-to-send frame-size*

Example: **test remote c1**

```
Number of frames to send [1]? 5
Frame length [265]?
Starting echo test -- press any key to abort
5 frames sent, 5 frames received, 0 compare errors, 0 timeouts
```

Number of frames to send	Total number of frames to send.
Frame length	Length of the frame sent. This frame cannot be any larger than the maximum frame length of the remote-secondary station.

Cancel the test by pressing any key.

Exit

Return to the GWCON prompt (+).

Syntax: exit

Example: **exit**

SDLC Interface and the GWCON Interface Command

While the SDLC interface has a console process for monitoring purposes, bridging routers also display complete statistics for installed interface when you use the **interface** command from the GWCON environment.

Statistics Displayed For SDLC Interface

The following statistics appear when you execute the **interface** command from the GWCON environment for SDLC interface:

```
                    Self-Test  Self-Test    Maintenance
Nt  Nt'    CSR       Passed     Failed         Failed
3   FR   80000000      1           0              0


SDLC MAC/data-link on Serial Line interface.

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

V.24 circuit:  105     106     107     108     109
Nicknames:     RTS     CTS     DSR     DTR     DCD
RS-232 DCE:    CA      CB      CC      CD      CF
State:         OFF     OFF     OFF     OFF     OFF

Line speed (configured):  9.615 Kbps
Last port reset:   1 minute, 24 seconds ago

Input frame errors:
    CRC error                0   alignment (byte length)   0
    Too short (< 2 bytes)    0   Too long (> 2051 bytes)   0
    aborted frame            0   DMA/FIFO overrun          0

Output frame errors:
    DMA/FIFO Underrun errors 0   Outputs aborts sent       0
```

Note: If a cable is not connected then cable and signal information is not displayed.

Nt	Interface number as assigned by software during initial configuration.
Nt'	Interface number as assigned by software during initial configuration.

CSR	Memory location of the control status register for the SDLC interface.
Self-test passed	Number of times the SDLC interface passed its self-test.
Self-test failed	Number of times the SDLC interface was unable to pass its self-test.
Maintenance failed	Number of maintenance failures.

The first six of the following parameters are displayed only if a cable is connected. The information displayed depends on the cable that is connected.

Level converter	Type of level converter connected to the SDLC interface.
Adapter cable	Type of adapter cable that the level converter is using.
V.24 circuit	Circuits being used on the V.24.
Nicknames	Signals being used on the V.24 circuit.
RS-232 DCE	Current level converter is RS-232 DCE.
State	State of V24 circuits, signals, and pin assignments (ON or OFF).
Line speed (configured)	Currently configured line speed for the SDLC interface.
Last port reset	How long ago the port was last reset.
Input frame errors	Input frame error type (CRC error, too short, aborted, alignment, too long, DMA/FIFO overrun) and the total number of errors that have occurred.
Output frame counters	Total number of DMA/FIFO overruns and output aborts sent for output frames.

12

Configuring the V.25 *bis* Network Interface

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

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

Accessing the Interface Configuration Process

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

Configuration Procedures

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

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

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

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

Setting Up a Serial Line Interface

To set up a serial line interface for V.25*bis*, do the following:

1. **Add a serial line interface** – At the `Config>` prompt use the **add device** command.
2. **Set the data-link protocol for the serial line interface** – At the `Config>` prompt, use the **set data-link v25-bis** command.

Example:
```
Config>add device quad-serial

   Device Slot # (0-2) [0]? 2
   Adding device as interface 10
   Defaulting Data-link protocol
   Config>set data-link v25bis
   Interface Number [0]? 10
```

Adding a Network Address Name and Network Address

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

To add a network address and network address name:

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

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

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

Adding Dial Circuits

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

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

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

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

Configuring Dial Circuit Parameters

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

```
Example: Config>network 6

   Circuit configuration
   Circuit Config>
```

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

Dial Circuit Configuration Commands

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

Table 12–1 lists the dial circuit configuration commands.

Table 12–1 Dial Circuit Configuration Commands Summary

Command	Function
? (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 data-link protocol configuration.
List	Displays the dial circuit configuration parameters.
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.

? (Help)

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

Syntax: ?

Example: **?**

```
DELETE
ENCAPSULATOR
LIST
SET
EXIT
```

Example: **Set ?**

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

Delete

Remove the inbound call settings from the dial circuit configuration.

Syntax: delete inbound destination

delete inbound destination

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

Example: **delete inbound**

Encapsulator

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

Syntax: encapsulator

Example: **encapsulator**

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

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

- The V.25 *bis* interface predefines clocking as external and encoding as NRZ. The DCE controls the clock speed. The V.25 *bis* interface ignores those parameters in the PPP or PSL configuration.

- The V.25 *bis* interface will not enforce transmit delay counters that you set in the PSL or PPP configurations.

- Make sure that the PSL frame size of the dial circuits on all routers is set to at least 602. (The default is 2048.) The PSL protocol requires an initial exchange of messages of this size.

- Do not enable pseudo-serial-ethernet on the dial circuit.

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

List

Display the current dial circuit configuration.

Syntax: list

Example: **list**

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

Base net:	Name of the serial line interface to which this dial circuit is mapped.
Destination name:	Network address name to be called for outbound circuits, and the default comparison address used by the caller-ID mechanism for inbound calls.
Inbound dst name:	This parameter appears only if the circuit is configured to accept inbound calls that do not match any other addresses.
Inbound dst name:	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.
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).
SelfTest Delay Timer	Displays the self-test delay timer setting in milliseconds. The range is 0 to 65535; 0 indicates no delay.

Set

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

Syntax: set
- net...
- calls...
- destination...
- inbound destination...
- any_inbound
- idle...
- selftest-delay...

net *# of serial line interface*

Specifies the number of the V.25 *bis* serial line interface to which you want to map this circuit.

Example: **set net 2**

calls *outbound* or *inbound* or *both*

Restricts this dial circuit to initiating outbound calls only, accepting inbound calls only, or both initiating and accepting calls. The default is both.

Example: **set calls outbound**

destination *address name*

This parameter is required for the dial circuit to operate. It specifies the network dial address of the remote router to which this dial circuit will connect. The caller-ID protocol uses this parameter as the default comparison address for incoming calls. This parameter must match an address name that you assigned at the Config> prompt using the **add v25-bis address** command.

Example: **set destination remote-site-baltimore**

inbound destination ***address name***

Set this parameter if the dial circuit is set up for both inbound and outbound calls and if this router's local dial address is different from the destination dial address that the remote router dials. For example, the numbers are different if one of the routers goes through a PBX, international, or inter-LATA exchange. This parameter overrides the default comparison address that the caller-ID protocol uses for incoming calls. This parameter must match an address name that you assigned at the `Config>` prompt using the **add v25-bis address** command.

`Example:` **`set inbound remote–site–1`**

any_inbound

Specifies that inbound calls that do not match any other dial circuit will be mapped to this circuit and accepted as inbound calls.

`Example:` **`set any_inbound`**

idle ***# of seconds***

Specifies a timeout period for the circuit. If there is no protocol traffic over the circuit for this specified time period, the dial circuit hangs up. The range is 0 to 65535, and default is 60 seconds. A zero setting specifies that there is no timeout period and that this is a dedicated circuit (leased line).

Note: For WAN-Restoral operations, you must set the idle timeout to 0.

`Example:` **`set idle 60`**

selftest-delay ***# of milliseconds***

You can use this parameter to delay the time between when the call is established and the initial packet is sent. The range is 0 to 65535, and the default is 150. If your modems take extra time to synchronize, adjust this setting.

Exit

Return to the `Config>` prompt.

Syntax: exit

`Example:` **`exit`**

V.25 *bis* Configuration Commands

This section explains the V.25 *bis* configuration commands. These commands allow you to display, create, or modify a V.25 *bis* configuration. Enter the V.25 *bis* configuration commands at the `V.25bis Config>` prompt.

Table 12–2 summarizes the V.25 *bis* configuration commands.

Table 12–2 V.25 *bis* Configuration Commands Summary

Command	Function
? (Help*)*	Lists the configuration commands or lists the options associated with that command.
List	Displays the V.25 *bis* configuration.
Set	Sets the local address, connect, disconnect, and no answer timeouts, number of retries after no answer, and command delay timeout.
Exit	Exits the V.25 *bis* configuration process and returns to the `Config>` prompt.

? (Help)

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

Syntax: ?

Example: **?**

```
LIST
SET
EXIT
```

Example: **Set ?**

```
COMMAND-DELAY-TIMEOUT
CONNECT-TIMEOUT
DISCONNECT-TIMEOUT
LOCAL-ADDRESS
RETRIES-NO-ANSWER
TIMEOUT-NO-ANSWER
```

List

Display the current V.25 *bis* configuration.

Syntax: list

Example: **list**

```
                V.25bis Configuration

   Local Network Address Name    = v403
   Local Network Address         = 1-508-898-2403

   Non-Responding addresses:
   Retries             = 1
   Timeout             = 0 seconds

   Call timeouts:
   Command Delay       = 0 ms
   Connect             = 60 seconds
   Disconnect          = 2 seconds
```

Local Network Address Name:	Displays the network address name of the local port.
Local Network Address:	Displays the network dial address of the local port.
Non-responding addresses:	
Retries	Maximum number of calls the router attempts to make to a non-responding address during the timeout period.
Timeout	If the router reaches the maximum number of retries to a non-responding address, it does not attempt to establish the call until this time has expired. This timeout period begins when the router attempts the first call.
Call timeouts:	
Command Delay	Amount of time, in milliseconds, that the router waits to initiate or answer a call after it turns on DTR (Data Terminal Ready). If you set this parameter to 0, the router waits for the modem to respond to DTR with the CTS (Clear to Send) signal before it issues commands.

Connect	Number of seconds allowed for a call to be established. If this parameter is set to 0, the modem controls the connection establishment timeout.
Disconnect	After the routers drops DTR it waits this amount of time before it initiates further calls. If you set this parameter to 0, the router waits for the modem to respond to the DTR drop by dropping CTS and DSR before it initiates the next call.

Set

Configure local addresses, timeouts and delays for calls, and retries and timeouts for non-responding addresses.

Syntax: set command-delay-timeout . . .
connect-timeout . . .
disconnect-timeout . . .
local-address . . .
retries-no-answer . . .
timeout-no-answer . . .

command-delay-timeout ***# of milliseconds***

After the router turns on DTR (Data Terminal Ready), it waits this specified amount of time before it initiates or answers a call. If you set this parameter to 0, the router waits for the modem to respond to DTR with the CTS (Clear to Send) signal before it issues commands. The range is 0 to 65535 milliseconds, and the default is 0.

Example: **set command–delay–timeout 0**

connect-timeout ***# of seconds***

Sets the number of seconds allowed for a call to be established. The range is 0 to 65535 seconds, and the default is 60. If you set this parameter to 0, the modem controls the connection timeout. Initially set this parameter to 0 and then use ELS event V25B.027 to find out how long it takes to establish connections to various destinations. You can then set this parameter to a number slightly higher than the longest connect time.

Note: Normally government regulation limits modem manufacturers to a maximum length for call setup. This value is merely an optimization, although interoperation with some DSUs may require that you change this parameter.

Example: **set connect-timeout 10**

disconnect-timeout ***# of seconds***

Specifies the amount of time, in seconds, that the router waits after dropping DTR before it initiates further calls. The range is 0 to 65535 seconds, and the default is 2. If you set this parameter to 0, the router waits for the modem to respond to the DTR drop by dropping CTS and DSR before it initiates the next call.

Example: **set disconnect-timeout 500**

local-address ***address name***

This is the network address name of the local port. This address name must match one of the names that you defined at the Config> prompt using the **add V25-bis-address** command.

Example: **set local-address line-1-local**

retries-no-answer ***value***

Some telephone service providers impose restrictions on automatic recalling devices to limit the number of successive calls to an address that is inaccessible or that refuses those calls. This parameter specifies the maximum number of calls the router attempts to make to a non-responding address during the timeout period. The range is 0 to 10, and the default is 1.

Note: Government regulation may also impose limits on the modem manufacturer that supersede this parameter.

Example: **set retries-no-answer 2**

timeout-no-answer ***# of seconds***

After the router reaches the maximum number of retries-no-answer to a non-responding address, it inhibits any further calls to that address until this time has expired. This timeout period begins when the router attempts the first call to an address. The range is 0 to 65535 seconds, and the default is 0. If you set this parameter to 0, the modem controls the timeout period.

Example: **set timeout-no-answer 180**

Exit

Return to the Config> prompt.

Syntax: exit

Example: **exit**

13

Monitoring the V.25 *bis* Network Interface

This chapter describes the V.25 *bis* console commands and GWCON commands.

Accessing the Interface Console Process

To access the interface console process for V.25 *bis*, use the **network** command at the GWCON (+) prompt followed by the number of the V.25 *bis* serial line interface. (You cannot directly access the V.25 *bis* console process for dial circuits, but you can monitor the dial circuits that are mapped to the serial line interface.) Once you have accessed the desired interface console process, you can begin entering console commands.

Note: V.25 *bis* interfaces also have ELS troubleshooting messages that you can use to monitor V.25 *bis*-related activity. See the *Event Logging System Messages Guide* for further details.

V.25 *bis* Console Commands

This section explains the V.25 *bis* console commands. These commands allow you to view the calls, circuits, parameters, and statistics of the V.25 *bis* interfaces. Enter the V.25 *bis* console commands at the `V.25bis>` prompt.

Table 13–1 summarizes the V.25 *bis* console commands.

Table 13–1 V.25 *bis* Console Command Summary

Command	Function
? (Help)	Lists the V.25 *bis* console commands or lists the options associated with specific commands.
Calls	List the number of completed and attempted connections made for each dial circuit mapped to this interface since the last time statistics were reset on the router.
Circuits	Shows the status of all data circuits configured on the V.25 *bis* interface.
Parameters	Displays the current parameters for the V.25 *bis* interface. (This command is similar to the `V.25bis Config>` **`list`** command.)
Statistics	Displays the current statistics for the V.25 *bis* interface.
Exit	Exits the V.25 *bis* console process and returns to the GWCON (+) process.

? (Help)

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

Syntax: ?

`Example:` **`?`**

```
CALLS
CIRCUITS
PARAMETERS
STATISTICS
EXIT
```

Calls

List the number of completed and attempted connections made for each dial circuit mapped to this interface since the last time statistics were reset on the router.

Syntax: calls

Example: **calls**

```
Net Interface  Site Name          In    Out   Rfsd  Blckd
  1     SL/0   v403                2      0      0      0

Unmapped connection indications:    0
```

Net	Number of the dial circuit mapped to this interface.
Interface	Type of interface and its instance number.
Site Name	Network address name of the dial circuit.
In	Number of inbound connections accepted for this dial circuit.
Out	Number of completed connections initiated by this dial circuit.
Rfsd	Number of connections initiated by this dial circuit that were refused by the network or the remote destination port.
Blckd	Number of connection attempts that the router blocked. The router blocks connection attempts if the local port is already in use, the maximum number of retries to a non-responding address is reached, or a modem is not responding.
Unmapped connection indications:	Number of connection attempts that were refused by the router because there were no enabled dial circuits that were configured to accept the incoming calls.

Circuits

Shows the status of all dial circuits configured on the V.25 *bis* port.

Syntax: circuits

Example: **circuit**

```
Net Interface  MAC/Data-Link    State     Reason      Duration
1       SL/0   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 data-link protocol configured for this dial circuit.
State	Current state of the dial circuit: • **Up** – Currently connected • **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. • **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. • **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

Display the current V.25 *bis* serial line configuration. Note that this is the same information displayed at the `V.25bis Config>` prompt using the **list** command.

Syntax: parameters

Example: **parameters**

```
          V.25 bis port Parameters

Local Network Address Name    = v402
Local Network Address         = 1–508–898–2402

Non–Responding addresses:
Retries             = 1
Timeout             = 0 seconds

Call timeouts:
Command Delay       = 0 ms
Connect             = 0 seconds
Disconnect          = 0 seconds
```

Local Network Address Name: Network address name of the local port.

Local Network Address: Network dial address of the local port.

Non-responding addresses:

- *Retries* — Maximum number of calls the router attempts to make to a non-responding address during the timeout period.
- *Timeout* — If the router reaches the maximum number of retries to a non-responding address, it does not attempt to establish the call until this time has expired. This timeout period begins when the router attempts the first call 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

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.
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.

Exit

Return to the GWCON (+) prompt.

Syntax: exit

Example: **exit**

V.25 *bis* and the GWCON Commands

While V.25 *bis* has its own console process for monitoring purposes, the router also displays configuration information and complete statistics for devices and circuits when you use the **interface**, **statistics**, and **error** commands from the GWCON environment. You can also use the GWCON **test** command to test DCEs and circuits.

Note: Issuing the **test** command to the V.25 *bis* serial interface causes the current call to be dropped and redialed.

Statistics for V.25 *bis* Interfaces and Dial Circuits

Use the **interface** command at the GWCON prompt (+) to display statistics for V.25 *bis* serial line interfaces and dial circuits.

To display the following statistics for a V.25 *bis* serial line interface, use the **interface** command followed by the interface number of the V.25 *bis* serial line interface.

Example: **interface 0**

```
                              Self-Test  Self-Test  Maintenance
Nt  Nt' Interface    CSR  Vec   Passed     Failed      Failed 0  0
V.25/0 80000000   44        1          0          0

V.25bis MAC/data-link on Serial Line interface

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

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

Line speed:              ~14.400 Kbps
Last port reset:         1 hour, 28 minutes, 25 seconds ago

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

To display the following statistics for a dial circuit, use the **interface** command followed by the interface number of the dial circuit.

Example: **interface 1**

```
                                 Self-Test  Self-Test  Maintenance
Nt Nt' Interface      CSR  Vec     Passed     Failed       Failed
1  0   SL/0      80000000   44          1          1            0

 Serial MAC/data-link on V.25bis dial interface

  Line Speed            : ~56.000 Kbps
  Last port reset : 0 seconds ago
```

The following table describes the output for both serial line interfaces and dial circuits.

Nt	Serial line interface number or dial circuit interface number.
Nt'	If Nt is a dial circuit, this is the interface number of the V.25 *bis* serial line interface to which the dial circuit is mapped.

Interface	Interface type and its instance number.
CSR	Command and status register addresses of base network.
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.
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 or OFF).
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 as a result were discarded.
Alignment (byte length)	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)	Number of packets received that were less than 2 bytes in length and as a result were discarded.
too long (>nnnn bytes)	Number of packets received that were greater than the configured frame size and as a result were discarded.

aborted frame	Number of packets received that were aborted by the sender or a line error.
Output frame counters:	
DMA/FIFO underrun errors	Number of times the serial interface card did not retrieve data fast enough from the system packet buffer memory to transmit them onto the network.
Output aborts sent	Number of transmissions that were aborted as requested by upper-level software.

14

Configuring Serial Line Interfaces

This chapter describes the commands to configure serial interfaces. Enter these commands after the `SLC Config>` prompt.

Important: To configure Frame Relay, PPP, X.25, and SDLC for DLSw on the serial interface, use the commands in this chapter and then refer to the commands in the chapters that describe the specific protocol.

Accessing the Interface Configuration Process

Follow the procedure described in the *System Software Guide* to access the interface configuration process and display the `SLC Config>` prompt. When you are done configuring the serial interface, enter the **restart** command after the OPCON prompt (`*`) and respond **yes** to the prompt to enable the new configuration.

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

Network Interfaces and the GWCON Interface Command

While serial line interfaces do not have their own console process for monitoring purposes, routers may display complete statistics for all installed network interfaces when you use the **interface** command from the GWCON environment.

Serial Line Configuration Commands

This section explains the serial line configuration commands. Enter these commands at the `SLC Config>` prompt.

Table 14–1 lists the serial configuration commands.

Table 14–1 Serial Configuration Command Summary

Command	Function
? (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, data link idle state, pseudo-serial-ethernet MAC address and IPX encapsulation, line speed, and the time that elapses between the transmission of each frame.
Exit	Exits the serial config process.

? (Help)

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

Syntax: ?

`Example:` **`?`**

```
DISABLE
ENABLE
LIST
RESERVE
SET
EXIT
```

Example: **set ?**

```
ENCODING
FRAME-SIZE
IDLE
PSEUDO-SERIAL-ETHERNET
SPEED
TRANSMIT-DELAY
```

Disable

Disable pseudo-serial-ethernet.

Syntax: disable pseudo-serial-ethernet

Example: **disable ps**

Enable

Use the **enable** command to send and receive routed frames in the Ethernet bridged packet format. This allows the pseudo-serial-ethernet end to be a serial line router, and the other end to be a bridge to Ethernet (only).

Note: Before you can enable pseudo-serial-ethernet, set the MAC address using the **set pseudo-serial-ethernet** command.

Syntax: enable pseudo-serial-ethernet

Example: **enable ps**

List

Display the current configuration for the serial interface.

Syntax: list

Example: **list**

```
Synchronous serial line interface configuration:

Maximum network layer frame size:           18000
Transmit delay counter:                     0 units
HDLC Data Encoding:                         NRZ
HDLC Idle State:                            Flag
Speed:                                      0

Pseudo Serial  Ethernet :                   Enabled
               Ethernet  MAC address:       200931234567
               Ethernet  IPX encapsulation: Ethernet _II
```

Note: The two lines in italic appear only when pseudo serial Ethernet is enabled.

Maximum network layer frame size	The maximum size of the frames transmitted on the data link, as specified by the **set frame-size** command.
Transmit delay counter	The minimum time that elapses between the transmission of each frame.
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 data link 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

Configure the encoding scheme, frame-size, data link idle state, pseudo-serial-Ethernet MAC address and IPX encapsulation, speed, and the time that elapses between the transmission of each frame.

Syntax: set encoding
frame-size
idle
pseudo *MAC-address*
pseudo frame *encapsulation-type*
transmit-delay

encoding *NRZ* or *NRZI*

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

Example: **set encoding nrz**

frame-size *#*

Sets the size of the network layer portion of frames transmitted and received on the data link. Data link and MAC layer headers are not included. The valid entries for # for the serial interface is fixed at 2046.

Example: **set frame–size 2000**

idle *flag* or *mark*

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

Example: **set idle flag**

pseudo *MAC-address*

Specifies a 12-digit hexadecimal MAC address. Interfaces use this as the "Ethernet " MAC address when frames are sent as bridged Ethernet.

Example: **set pseudo MAC 203456345567**

pseudo frame *encapsulation-type*

Specifies the Ethernet IPX encapsulation. The choices include:

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-VMS 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`**

transmit-delay #

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

A value of 0 transmits frames separated by as few as one HDLC flag. A value of 1 causes a minimum of two HDLC flags between transmitted frames.

For the RouteAbout Access EW serial interface, # is between 0 and 65535. Zero disables and 1 to 65535 allows you to select the delay between frames, independent of line speed. This delay is produced in units of 5 milliseconds.

Table 14–2 lists the starting transmit delay values for each type of interface. If you have problems with frames missing in the interface card counters, increase the transmit delay value.

Example: **set transmit 1**

Table 14–2 Transmit Delay Values

Model Number	Transmit-Delay Value
RouteAbout Access EW	6
RouteAbout Access TW	40

Exit

Return to the previous prompt level.

Syntax: exit

Example: **exit**

15

Monitoring Serial Line Interfaces

This chapter describes how to monitor the serial line interfaces.

Serial Interfaces and the GWCON Interface Command

While the serial line interface does not have its own console process for monitoring purposes, bridging routers display complete statistics for all installed network interfaces when you use the **interface** command from the GWCON environment.

Statistics for the Serial Interfaces

This section describes the statistics for the serial interfaces. To view these statistics, enter the **interface** command at the GWCON prompt (+).

Serial Interface Line Interface Example

The following example shows the output for the serial interface.

```
                                    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

Serial MAC/data-link on Dual Serial Line Interface

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 preceding output.

Nt	Global network number.
Nt'	Number for `Nt'` is identical to the number for `Nt`. Ignore this output for the dual serial interface card.
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.

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 dual serial interface.

RouteAbout Access EW Serial Line Interfaces

The following example shows output for the RouteAbout Access EW serial interface. Descriptions of the output start on the next page.

```
+ interface
                                    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

  Serial MAC/data-link on SCC Serial Line interface

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

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

  Line speed:              ~1.859 Mbps
  Last port reset:         11 seconds ago

  Input frame errors:
   CRC error                     0   alignment (byte length)           2
   missed frame                  0   too long (>  2052 bytes)          0
   aborted frame                 0   DMA/FIFO overrun                  0
   L & F bits not set            0
  Output frame counters:
   DMA/FIFO underrun errors      0   Output aborts sent                0
+
```

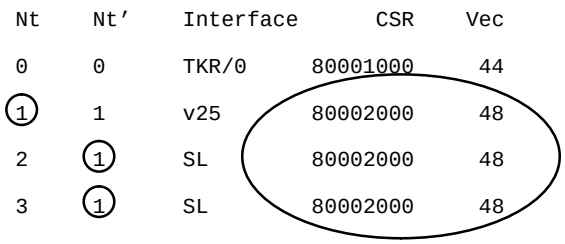
Nt Global network number.

Nt' Network on which a V.25 circuit is configured. The previous output indicates the following:

`Nt 0` is a standard token-ring network.

`Nt 1` is the network on which the base V.25 device is configured.

`Nt 2` and `Nt 3` are V.25 circuits configured for serial lines. This is indicated because the `Nt'` number is identical to the number in the `Nt` field for the base V.25 interface. Also, the `CSR` and `Vec` fields are identical to `Nt 1`. Refer to the following example.



Nt	Nt'	Interface	CSR	Vec
0	0	TKR/0	80001000	44
1	1	v25	80002000	48
2	1	SL	80002000	48
3	1	SL	80002000	48

Interface Interface name and its port number.

CSR Command and status register addresses.

Vec Interrupt vector address.

Self-Test Passed Number of self-tests that succeeded.

Self-Test Failed Number of self-tests that failed.

Maintenance Failed Number of maintenance failures.

Adapter cable Adapter cable type.

V.24 circuit Nicknames Pin Assignments State	Circuits, control signals, pin assignments and their state (ON or OFF). Table 15–1 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 quad serial interface card 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 15–1 lists the V.24 circuits, nicknames, nickname descriptions, cable types and cable circuit function descriptions.

Table 15–1 V.24 Circuits and States

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 15–1 (Cont.) V.24 Circuits and States

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
135			IS	Terminal In Service
140			RL	Remote Loopback
141			LL	Local Loopback
142			TM	Test Mode

(continued on next page)

Table 15–1 (Cont.) V.24 Circuits and States

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

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		

(continued on next page)

Table 15–1 (Cont.) V.24 Circuits and States

Cable Type: 120 Ohm Pair				
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: Undefined
The software has not yet detected the cable type, or no cable is connected.

16

Configuring IEEE 802.5 Token-Ring Network Interfaces

This chapter describes how to set software configurable information for the token ring interfaces in the router.

Accessing the Interface Configuration Process

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

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

Token Ring Configuration Commands

The following sections explain the token ring configuration commands. Enter the commands at the `TKR config>` prompt.

Table 16–1 lists token ring configuration commands.

Table 16–1 Token Ring Configuration Command Summary

Command	Function
? (Help)	Displays all the token ring commands or lists subcommand options for specific commands.
Connector-location	Sets the connector location.
Frame	Sets the NetWare IPX encapsulation type.
List	Displays the selected token ring interface configuration.
Media	Sets the media-type as shielded or unshielded.
Packet-Size	Changes packet-size defaults for this token-ring network.
Set	Sets the aging timer for the RIF cache and the MAC address.
Source-routing	Enables or disables source-routing on the interface.
Speed	Sets the interface speed in MB/sec.
Exit	Exits the token ring config process.

? (Help)

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

Syntax: ?

Example: **?**

```
CONNECTOR-LOCATION
FRAME
LIST
MEDIA
PACKET-SIZE
SET
SOURCE-ROUTING
SPEED
EXIT
```

Connector-Location

Specify the Ethernet or token ring interface location in your hub module. This command is used in certain interface configurations where the enhanced module supports the backplane. The options available for *location* are FRONT and BACK. All backplane (BACK) interfaces must be located in Slot 0. The default setting is FRONT.

If the backplane is not supported in an interface's configuration (for example, an Ethernet interface is in slot 1) then the **connector-location** command is not present from that interface's configuration process.

Syntax: connector-location *location*

Example: **`connector-location front`**

Frame

Set the NetWare IPX encapsulation type. Table 16–2 lists the encapsulation types you can use.

Table 16–2 Frame Command NetWare IPX Encapsulation Types

Option	Description	Syntax
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.

List

Display the current configuration for the token ring interface.

Note: If the MAC address is 0, the default station address is used.

Syntax: list

Example: **list**

```
Token-Ring configuration:

Packet size (INFO field):     2052
Speed:                        16 Mb/sec
Media:                        Unshielded
Connector Location:           Front

RIF Aging Timer               120
Source Routing:               Disabled
MAC Address:                  000000000000
```

Packet size	Indicates the size of the token ring packet.
Speed	Indicates the speed of the network.
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.

Media

Change network media type. The default media type is STP cable. Valid media type values are *shielded* and *unshielded.* Enter the **media** command followed by the *media-type*.

Note: The bridging routers may also use **auto-config** as a media setting. This setting automatically selects the media type.

Syntax: media *media-type*

Example: **media unshielded**

Packet-Size

Change packet-size defaults for all token-ring networks. Enter the **packet-size** command followed by the desired number of bytes.

Note: Changing packet size can greatly increase buffer memory requirements.

Syntax: packet-size *#bytes*

Example: **packet-size 4399**

Set

Set the Routing Information Field (RIF) timer and the physical (MAC) address.

Syntax: set physical-address
rif-timer

physical address

Sets the MAC address that is placed in the RIF by nodes running DNA phase IV with AMA.

Example: **set physical-address**

```
MAC address in 00:00:00:00:00:00 []?
```

Note: Pressing **RETURN** leaves the value the same. Entering **0** causes the router to use the factory station address. The default is to use the factory station address.

rif-timer

Sets the maximum amount of time (in seconds) that the information in the RIF is maintained before it is refreshed. The default is 120.

Example: **set rif-timer**

```
RIF aging timer value [120]?  120
```

Source-routing

Enable or disable endstation source routing. This is the process by which end stations determine the source route to use to cross source routing bridges. This allows the IP, IPX, AppleTalk Phase 2, and DNA Phase IV protocols to reach nodes on the other side of the source routing bridge.

This switch is completely independent of whether this interface is providing source routing through the SRT forwarder. The default setting is enabled.

Some stations cannot properly receive frames with a Source Routing RIF on them. This is especially common among NetWare drivers. Disabling source routing in this situation allows you to communicate with these stations.

Enable source routing only if there are source routing bridges on this ring that you want to bridge IP, IPX, AppleTalk Phase 2, or DNA Phase IV packets through.

Syntax: source-routing enable
disable

Example: **source-routing enable**

Speed

Change data speed. The default speed is 4 Mbps. Enter the **speed** command followed by the *speed-value* (in Mb/sec).

Syntax: speed *speed-value*

Example: **speed 16**

Exit

Use the **exit** command to return to the Config> prompt.

Syntax: exit

Example: **exit**

17

Monitoring IEEE 802.5 Token Ring Network Interfaces

This chapter describes how to monitor specific Token ring interfaces in the router by using either the interface console commands or the GWCON **interface** command.

For more information about token ring, refer to the *Bridging Router Reference Guide.*

Accessing the Interface Console Process

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

Token Ring Interface Console Commands

This section explains the token ring console commands. Enter commands at the `TKR>` prompt. Table 17–1 lists the console commands.

Table 17–1 Token Ring Console Command Summary

Command	Function
? (Help)	Displays all the token ring commands or lists subcommand options for specific commands.
Dump	Displays a dump of the RIF cache.
LLC	Displays the LLC configuration prompt.
Srt-stat	Displays statistical information for transparent bridging.
Exit	Exits the token ring config process.

? (Help)

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

Syntax: ?

Example: **?**

```
DUMP
LLC
SRT-STAT
EXIT
```

Dump

Request a dump of the RIF cache contents when source routing is enabled in the `tkr config>` process.

Syntax: dump

Example: **dump**

```
MAC address    State          Usage          RIF
0000C90B1A57   ON_RING         Yes           0220
```

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.

LLC

Access the LLC monitoring prompt. LLC commands are entered at this new prompt. See the "LLC Monitoring Commands" section of this chapter for an explanation of each of these commands.

Syntax: llc

Example: **llc**

```
LLC user monitoring
LLC>
```

SRT-STAT

Use the **srt-stat** command to display information specific to transparent bridging configured on this interface.

Syntax: srt-stat

Example: **srt-stat**

Exit

Use the **exit** command to return to the previous prompt level.

Syntax: exit

Example: **exit**

LLC Monitoring Commands

This section explains all of the LLC configuration commands. These commands let you configure the LLC when you need to pass packets over an SNA network. Table 17–2 lists token ring configuration commands.

Table 17–2 Token Ring Configuration Command Summary

Command	Function
? (Help)	Displays all the LLC commands or lists subcommand options for specific commands.
Clear-counters	Clears all statistical counters.
List	Displays interface, SAP, and session information.
Set	Allows the user to dynamically configure LLC parameters that are valid for the life of the session.
Exit	Exits the LLC monitoring process.

? (Help)

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

Syntax: ?

Example: **?**

Clear-Counters

Clear all the LLC statistical counters.

Syntax: clear-counters

Example: **clear-counters**

List

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

Syntax: list interface
sap . . .
session

interface

Displays all SAPs opened on this interface.

Example: **list interface**

```
SAP            Number of Sessions
F4             1
```

SAP *sap_number*

Displays information for the specified SAP on the interface.

Example: **list sap**

```
SAP value in hex (0-FE) [1]? F4

Interface                     0, TKR /0
Reply Timer (T1)              1 sec
Receive ACK Timer (T2)        100 millisec
Inactivity Timer (Ti)         30 sec
MAX Retry Value (N2)          8
MAX I-Field Size (N1)         2052
Rcvd I–frames before ACK (N3) 1
Transmit Window Size (Tw)     2
Acks Needed to Inc Ww (Nw)    1

Frame          Xmt            Rcvd
UI-frames      4              5
TEST-frames    0              1
XID-frames     0              0
I-frames       291            26
RR-frames      81             291
RNR-frames     0              0
REJ-frames     0              0
SABME-frames   1              0
UA-frames      0              1
DISC-frames    0              0
DM-frames      0              0
FRMR-frames    0              0
I-frames discarded by LLC                   0
I-frames Refused by LLC user                0

Cumulative number of sessions               1
Number of active sessions                   1
```

```
Session ID                                        Remote
(int-sap-id)  Local MAC          Remote MAC         SAP  State
00-F4-0000    00:00:C9:08:41:DB  10:00:5A:F1:02:37  F4   OPENED
```

SAP value in hex (0-FE)	The SAP value of the session.
Interface	The interface number and type over which the session is running.
Reply Timer (T1)	Indicates the time it takes for this timer to expire when the LLC fails to receive an acknowledgment or response from the other LLC station.
Receive ACK Timer (T2)	Indicates the time delay the LLC uses before sending an acknowledgment for a received I-frame.
Inactivity Timer (Ti)	Indicates the time the LLC waits during inactivity before issuing an RR.
MAX Retry Value (N2)	The maximum number of retries by the LLC protocol.
MAX I-Field Size (N1)	Maximum amount of data (in bytes) allowed in the I-field of an LLC2 frame.
Rcvd I-frame before ACK (N3)	Indicates the value that is used with T2 timer to reduce acknowledgment traffic for received I-frames.
Transmit Window Size (Tw)	Indicates the maximum number I-frames that can be sent before receiving an RR.
Acks Needed to Inc Ww (Nw)	Indicates the number of I-frames that the LLC must receive before incrementing Ww by 1.
Frames – Xmt and Rcvd	Counter that displays the total number of frame types transmitted (Xmt) and (Rcvd).
I-frames discarded by LLC	Counter that displays the total number of I-frames discarded by the LLC, usually because the sequence number is out of sequence.

I-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) and DLSw (Data Link Switching).
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.
Remote MAC	The remote LLC's MAC address.
Remote SAP	The remote "side's SAP" of the LLC connection.
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.

Session

Displays information on the specified LLC session that is open on the interface.

Example: **list session**

```
Session Id: [0]? 0-F4-000
Interface                     0, TKR /0
Remote MAC addr               10:00:5A:F1:02:37
Source MAC addr               00:00:C9:08:35:47
Remote SAP                    F4
Local SAP                     F4
RIF                           (089E 0101 0022 0010)
Access Priority               0
State                         LINK_OPENED
Replay Timer                  1 sec
Receive ACK Timer (T2)        100 millisec
Inactivity Timer (Ti)         30 sec
MAX I-Field Size (N1)         2052
MAX Retry Value (N2)          8
Rcvd I–frames before ACK (N3) 1
Transmit Window Size (Tw)     2
Working Transmit Size (Ww)    2
Acks Needed to Inc Ww (Nw)    1
Current Send Seq (Vs)         9
Current Rcv Seq (Vr)          7
Last ACK'd sent frame (Va)    9
No. of frames in ACK pend q   0
No. of frames in Tx pend q    0
Local Busy                    NO
Remote Busy                   NO
Poll Retry count              8
Appl output flow stopped      NO
Send process running          YES

Frame          Xmt            Rcvd
I-frames       1456           2678
RR-frames      502            403
RNR-frames     0              0
REJ-frames     0              0
I-frames discarded by LLC                  0
I-frames Refused by LLC user               0
```

Session Id	Indicates the session ID number.
Interface	Indicates the number of the interface over which this session is running.
Remote MAC addr	Indicates the MAC address of the remote LLC peer.
Source MAC addr	Indicates the MAC address of the local LLC.

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.
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** 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) and DLSw (Data Link Switching).

Set

Dynamically configure the LLC parameters on a current LLC session. Any changes that you make to the parameters are effective for the life of session. These parameters are the same as those listed in Chapter 16, “Configuring IEEE 802.5 Token-Ring Network Interfaces.”

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

Syntax: set n2-max_retry *count*
n3-frames-rcvd-before-ack *count*
nw-acks-to-inc-ww *count*
t1-reply-timer *seconds*
t2-receive-ack-timer *seconds*
ti-inactivity-timer *seconds*
tw-transmit-window *seconds*

n2-max_retry

The maximum number of retries by LLC protocol. For example, N2 is the maximum number of times the LLC transmits an RR without receiving an acknowledgment when the inactivity timer expires. Default is 8. Minimum is 1. Maximum is 127.

Example: **set n2-max_retry**

n3-frames-rcvd-before-ack

This value is used with the T2 timer to reduce acknowledgment traffic for received I-frames. Set this counter to a specified value. Each time an I-frame is received, this value is decremented. When this counter reaches 0 or the T2 timer expires, an acknowledgment is sent. Default is 1. Minimum is 1. Maximum is 255.

Example: **set n3-frames-rcvd-before-ack**

nw-acks-to-inc-ww

When the ability to send I-frames is not working, the LLC protocol goes into a mode where the working window (Ww) is set back to 1, and is then slowly increased back to its normal size (Tw). This is known as the dynamic window algorithm. This value is the number of I-frames that the LLC must receive before incrementing Ww by 1. Default is 1. Minimum is 1. Maximum is 127.

Example: **set nw-acks-to-inc-ww**

t1-reply-timer

This timer expires when the LLC fails to receive a required acknowledgment or response from the other LLC station. When this timer expires, an RR is sent with

the poll bit set and T1 is started again. If the LLC receives no response after the configured maximum number of retries (N2), the link underneath is declared inoperative. Default is 1. Minimum is 1. Maximum is 256.

Example: **set t1-reply-timer**

t2-receive-ack-timer

This timer is used to delay sending of an acknowledgment for a received I-format frame. This timer is started when an I-frame is received and reset when an acknowledgment is sent. If this timer expires, LLC2 sends an acknowledgment as soon as possible. Set this value so that it is less than that of T1. This ensures that the remote LLC2 peer receives the delayed acknowledgment before the T1 timer expires. Default is 1 (100 ms). Minimum is 1. Maximum is 2560.

Example: **set t2-receive-ack-timer**

Note: If this timer is set to 1 (the default), it does not run (for example, **n3-frames-rcvd-before-ack=1**).

ti-inactivity-timer

Expires when the LLC does not receive a frame for a specified time period. When this timer expires, the LLC transmits an RR until the other LLC responds or the N2 timer expires. Default is 30 seconds. Minimum is 1 second. Maximum is 256 seconds.

Example: **set ti-inactivity-timer**

tw-transmit-window

Sets the maximum number of I-frames that can be sent before receiving an RR. Assumes that the other end of the LLC session can actually receive this many consecutive I-frames, and that the router has enough heap memory to keep copies of these frames until an acknowledgment is received. Increasing this value may increase the throughput. Default is 2. Minimum is 1. Maximum is 127.

Example: **set tw-transmit-window**

Exit

Return to the previous prompt level.

Syntax: exit

Example: **exit**

Token Ring Interfaces and the GWCON Interface Command

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

Statistics Displayed for 802.5 Token Ring Interfaces

The following statistics display when you enter the **interface** command from the GWCON environment for the Token ring interfaces.

```
                                    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 ProNET -4/16 interface

Physical address       000C90820C7
Network speed              16 MBps
Max packet size (INFO)        2052
Handler state            Ring open
Interface Restarts               0

# times Signal lost             0          # times Beaconing           0
Hard errors                      0          Lobe wire faults           0
Auto-removal errors              0          Removes received           0
Ring recovery actions            0

Line errors                      0          Burst errors               0
ARI/FCI errors                   0          Inputs dropped             0
Frame copy errors                0          Token errors               0
Lost frames                      0
```

The following section describes general interface statistics:

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.
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.
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 nonzero priority equals one.

- The MONITOR_COUNT bit of a frame equals one. No token or frame is received within a 10-ms window.
- The starting delimiter/token sequence has a code violation in an area where code violations must not exist.

18

Configuring the X.25 Network Interface

This chapter describes the X.25 configuration commands.

The X.25 network interface connects a router to an X.25 virtual circuit switched network. The X.25 network interface software and hardware allows the router to communicate over a public X.25 network. The X.25 network interface complies with CCITT 1980 and 1984 specifications for X.25 interfaces offering multiplexed channels and reliable end-to-end data transfer across a wide area network.

Accessing the Interface Configuration Process

Follow the procedure described in Chapter 1, in the *System Software Guide* to access the interface configuration process for the interface described in this chapter.

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

Basic Configuration Procedures

This section outlines the minimal configuration steps required to get the X.25 interface up and running.

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

- **Setting the local X.25 address**. You must set the router's local X.25 address using the **set address** command. The X.25 address is a unique X.121 address

that is used during call establishment. Failure to set the network address prevents the X.25 interface from joining the attached network.

- **Setting the data link to X..25**. You must set the data link to X.25 using the **set data-link x25** command.

- **Setting DCE/DTE equipment type**. You must specify whether the frame and packet levels act as DCE or DTE using the **set equipment-type** command. The default for this command is DTE.

Note: Keep the following restrictions in mind when defining PVCs and SVCs:

1. The router interface can support any combination of PVCs and SVCs up to a maximum of 239.
2. The range of defined PVCs *must not* over-lap the defined range of SVCs.
3. Virtual circuit identifiers can be defined between 1 and 4095.

- **Defining the high and low SVCs**. Define the lower and upper range of the SVCs that you are using. Use the **set svc low** and **set svc high** commands. You can choose from three SVC types: two-way, inbound, and outbound. The default is svc low-two = 1 and svc high-two = 64. All other SVC types default to 0.

- **Defining PVCs**. If you are using PVCs, you must define the range of PVCs that you are using. Use the **set pvc low** and **set pvc high** commands. The range of PVCs *must not* over-lap the SVC ranges. *Define PVCs.* You must define PVCs individually (for example, add pvc).

- **Adding a protocol**. Add the protocols to run over the X.25 interface: IP, IPX, or DN. Use the **add protocol** command. Note that you only need to add the protocols once for all X.25 networks on router.

- **Adding a protocol address**. Add an address translation for each protocol's destination address reachable over this interface. Use the **add address** command.

Addressing

You must assign a unique X.121 network address to each X.25 network interface. Failure to set the network address prevents the X.25 interface from joining the attached network. This address is used during call establishment and also used by the remote DTE for mapping the destination protocol addresses to the X.121 call addresses. The source address of one DTE is the destination for another, thus facilitating the piggybacking of protocol return traffic on previously established circuits. The mapping between the destination protocol address and the destination DTE address is configured using the X.25 configuration **add address** command. (This command is described in more detail later in this chapter). You can assign different protocol destination addresses to a single destination DTE address.

The mapping of the protocol to the X.121 call address is static (SRAM) and is configured on a per protocol and a per network interface basis. The exception is DDN addresses (IP HostTableFormat Addresses), which can also be configured as static permanent entries or dynamically instantiated in parallel to the IP protocol packet send sequence. Dynamic translations of IP HTF addresses to X.121 addresses are not saved over router restarts and are not displayed through the **list** option in the configuration command because they are not saved in SRAM.

The Call User Data (CUD) field is used for IPX to X.25 address mapping only. It determines how the CUD field is filled in when call request packets are received for IPX. The CUD Field can be either Standard or Proprietary. Standard indicates that the usage is protocol multiplexing used in RFC 1356. The default is Standard.

Setting the X.25 Node Address

Specify an X.25 node address for each interface by entering the X.25 configuration **set address** command.

Setting the National Personality

Each public data network, such as GTE's Telenet or DDN's Defense Data Network, has its own standard configuration. The term *National Personality* specifies a group of variables used to define a public data network's characteristics. The configuration information in the National Personality provides the router with control information for packets being transferred over the link. The National Personality option defines 28 default parameters for each public data network.

To view the configuration values that are in your X.25 National Personality, execute the X.25 configuration **list detailed** command. Configure each public data network connected to the router by executing the X.25 configuration **set national personality** command.

The National Personality is a generalized template for network configuration. If necessary, you can individually configure each frame and packet layer parameter.

X.25 Configuration Commands

This section summarizes and explains all the X.25 configuration commands.

Table 18–1 lists the X.25 configuration commands, which allow you to specify network parameters for router interfaces that transmit X.25 packets. The information you specify with the configuration commands activates when you restart the router.

Enter the X.25 configuration commands at the `X.25 config>` prompt.

Table 18–1 X.25 Configuration Commands Summary

Command	Function
? (Help*)*	Lists the interface configuration commands or lists the options associated with specific commands.
Add	Adds an address translation, a protocol encapsulation, or a PVC definition.
Change	Changes an address translation, a protocol encapsulation, or a PVC definition.
Delete	Removes an address translation, a protocol encapsulation, or a PVC definition.
Disable	Disables interface-resets, incoming-calls-barred, outgoing-calls-barred feature, or dynamic DDN address translations.
Enable	Enables interface-resets, incoming-calls-barred, outgoing-calls-barred features, or dynamic DDN address translations.
List	Lists the defined address translations, National Personality Parameters, protocol encapsulation, or PVC definitions.
National Disable	Disables features defined by the National Personality configuration.
National Enable	Enables features defined by the National Personality configuration.
National Restore	Restores the National Personality configuration to its default values.
National Set	Sets parameters defined by the National Personality configuration.
Set	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.
Exit	Exits the X.25 configuration process.

? (Help)

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

Syntax: ?

Example: **?**

```
ADD
CHANGE
DELETE
DISABLE
ENABLE
LIST
NATIONAL-PERSONALITY
SET
EXIT
```

Add

Add an X.25 address, a DDN X.25 address, a protocol configuration, or a PVC definition.

Syntax: add address
htf-address
protocol
pvc

address

Adds a PDN (Public Data Network) X.25 address translation for a protocol supported in the configuration of the router. The prompts that appear depend on the protocol address that you are adding (see following examples). The protocol address and X.25 address being entered represent the protocol and X.25 address at the remote end of the X.25 link. The **set address** command is used to set the local X.25 address.

Example: **add address**

IP example:

```
Protocol [IP]? IP
IP Address [0.0.0.0]?
X.25 Address []?
```

IPX example: `Protocol [IP]? **IPX**`

```
CUD Field Usage (Proprietary or Standard) [Standard]?
IPX Host Number (in hex) []?
X.25 Address []?
```

DN example: `Protocol [IP]? **DN**`

```
Decnet Address [0.0]?
X.25 Address []?
```

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 messages appears: • `Invalid CUD usage type` • `Standard default will be used`
Decnet	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.

htf-address

Adds a DDN (Defense Data Network) X.25 address translation.

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 sized 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 sized 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.

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 6.

pvc

Adds a PVC definition. The prompts that appear depend on the protocol that you are adding the PVC.

Example: **add pvc**

IP example: Protocol [IP]? **IP**

```
Packet Channel [1]?
Destination X.25 Address[]?
Window Size [2]?
Packet Size [128]?
```

IPX example: Protocol [IP]? **IPX**

```
Packet Channel [1]?
Destination X.25 Address []?
Window Size [2]?
Packet Size [128]?
```

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 outstanding before an acknowledgment is sent. 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

Modify a PDN X.25 address, DDN X.25 address, protocol configuration, or a PVC definition.

Syntax: change address
htf address
protocol
pvc

address

Modifies a PDN X.25 address translation. The prompts that appear depend on the protocol that are changing.

Example: **change address**

IP example:
```
Protocol [IP]? IP
IP Address [0.0.0.0]?
X.25 Address [00000124040000]?
```

IPX example: Protocol [IP]? **IPX**

```
CUD Field Usage (Proprietary or Standard) [Standard]?
IPX Host number (in hex) []?
X.25 Address [00000124040000]?
```

DN example: Protocol [IP]? **DN**

```
Decnet Address [0.0]?
X.25 Address [00000124040000]?
```

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 messages appear: • `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	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.

hft address

Changes a DDN X.25 address translation.

Example: **change htf-address**

```
Protocol [IP]
Change HTF address [0.0.0.0]?
New HTF address [10.4.0.124]?
```

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 HFT address. The default is current HFT address.

protocol

Changes a protocol configuration definition.

Example: **change protocol**

```
Protocol [IP]
Window Size [2]
Default Packet Size [128]
Maximum Packet Size [256]
Circuit Idle Time [30]
Maximum VCs [6]
```

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 sized 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 sized 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.

pvc

Changes a PVC definition. The prompts that appear, depend on the protocol's PVC that you are changing.

Example: **change pvc**

IP example:
```
Protocol [IP]? IP
   Packet Channel [1]?
   Destination X.25 Address[]?
   Window Size [2]?
   Packet Size [128]?
```

IPX example:
```
Protocol [IP]? IPX
   Packet Channel [1]?
   Destination X.25 Address []?
   Window Size [2]?
   Packet Size [128]?
```

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 currently defined X.25 address.
Window Size	Specifies the number of packets that can be outstanding before an acknowledgment is sent. 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

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**

pvc

Deletes a PVC definition.

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

Disable DDN address translations, interface resets as part of network certification, or the incoming-calls-barred or the outgoing-calls-barred features.

Syntax: disable ddn-address-translations
interface-resets
incoming-calls-barred
outgoing-calls-barred

ddn-address-translations

Specifies that the DDN host table format (IP) addresses are not dynamically converted to X.121 call addresses.

Example: **disable ddn-address-translations**

interface-resets

Specifies that both the packet layer restarts and frame layer link establishment is initiated by the network interface. This feature is used during certification testing to enable the network to control packet and frame layer restarts.

Example: **disable interface resets**

incoming-calls-barred

Specifies that the router accepts incoming calls.

Example: **disable incoming-calls-barred**

outgoing-calls-barred

Specifies that the router allows outgoing calls.

Example: **disable outgoing-calls-barred**

Enable

Enable DDN address translations, interface resets, or to enable the incoming-calls-barred or the outgoing-calls-barred features.

Syntax: enable ddn-address-translations
interface-resets
incoming-calls-barred
outgoing-calls-barred

ddn-address-translations

Specifies that the DDN host table format (IP) addresses are dynamically converted to X.121 call addresses. The default is Disabled.

Example: **enable ddn-address-translations**

interface-resets

Specifies that both the packet layer restarts and the frame layer link establishment can be initiated by either the router or the network interface. This feature is used during normal operation. The default is Enable.

Example: **enable interface-resets**

incoming-calls-barred

Specifies that the router does not accept incoming calls. The default is Enable.

Example: **enable incoming-calls-barred**

outgoing-calls-barred

Specifies that the router does not allow outgoing calls. The default is Enable.

Example: **enable outgoing-calls-barred**

List

Display the current configuration for the specified parameter.

Syntax: list addresses
all
detailed
protocols
pvc
summary

addresses

Lists all the X.25 address translations.

Example: **list addresses**

```
X.25 address translation configuration

IF#      Prot #       Protocol       X.25 address
1         0           10.1.2.3       1238765742
1         4           1.10           9910
1         7           10             12389    CUD Field = Standard
```

IF#	Displays the current interface number. You accessed this at the Config> prompt using the **net <number>** command. All addresses listed belong to this network.
Prot#	Displays the identification of the protocol that this mapping is defined.
Protocol	Displays the destination address of the protocol.
X.25 address	Displays the protocol X.25 address corresponding to that protocol address.
CUD Field	This field is for IPX to X.25 address mapping only. It determines how the Call User Data field is filled in when call request packets are received for IPX. The CUD Field can be either Standard or Proprietary. Standard indicates that the usage is the protocol identification specified in RFC 1356. The default is Standard.

all

Lists all the X.25 addresses, National Personality parameters, all defined protocols and their values, and all defined PVC's.

Example: **list all**

```
X.25 Configuration Summary
Node Address: 23785763
Max Calls Out: 15             Inter–Frame Delay:       0
Default Window: 4             SVC idle: 25 seconds
National Personality: GTE Telenet (DTE)
PVC             low: 1  high: 2
Inbound         low: 0  high: 0
Two-Way         low: 5  high: 64
Outbound        low: 0  high: 0
Throughput Class in bps Inbound:  2400
Throughput Class in bps Outbound: 2400

X.25 National Personality Configuration
Follow CCITT: on     OSI 1984:   on     OSI 1988:      off
Clear w/diag: on   Reset w/diag: on      Restart w/diag: on
Request Reverse Charges: on  Accept Reverse Charges: on
Allow Packet Restarts: on  Suppress Calling Addresses: off
Suppress Cause Fields: on  Suppress Frame Idle RRs: off
Frame Extended seq mode: off Packet Extended seq mode: off
Use Multi-link Addresses: off Disable Interface Resets: off
Incoming Calls Barred: off Outgoing Calls Barred:  off
Throughput Negotiation: on  Flow Control Negotiation: on
DDN Address Translation   off


Call Request Timer:     20 decaseconds
Clear Request Timer:    18 decaseconds (1 retries)
Reset Request Timer:    18 decaseconds (1 retries)
Restart Request Timer:  18 decaseconds (1 retries)
T1 Timer: 4 seconds     N2 timeouts: 20
T2 Timer: 2 seconds     DP Timer:    500 milliseconds
Standard Version:  1984      Network Type: CCITT
Disconnect Procedure: passive
Window Size     Frame:   7      Packet:  2
Packet Size     Default: 128    Maximum: 256
X.25 protocol configuration
Prot         Window        Packet-size             Idle
Number       Size            Default Maximum       Time
 0              7               128     256             30

X.25 PVC configuration
Prtcl   X.25_address    Window  Pkt_len L3_chan
0       21309001122330    7       128     1

X.25 address translation configuration
IF #    Prot #  Protocol -> X.25 address
 4       0      128.185.184.26 -> 21309001122330
 4       0      128.185.184.21 -> 21309445566770
```

detailed

Lists the value of all the default parameters that the **national set** command modifies. Descriptions of the screen display are listed in the **national set** command described later in this chapter.

Example: **list detailed**

```
X.25 National Personality Configuration

Follow CCITT: on           OSI 1984: on   OSI 1988: off
Clear w/diag: on       Reset w/diag: on    Restart w/diag: on
Request Reverse Charges: on   Accept Reverse Charges:     on
Allow Packet Restarts:   on   Suppress Calling Addresses: off
Suppress Cause Fields:   on   Suppress Frame Idle RRs:    off
FrameExtended seq mode:  off  PacketExtended seq mode:    off
UseMulti-linkAddresses:  off  Disable Interface Resets:   off
Incoming Calls Barred:   off  Outgoing Calls Barred:      off
Throughput Negotiation:  on   Flow Control Negotiation:   on
DDN Address Translation: off
Call Request Timer:     20 decaseconds
Clear Request Timer:    18 decaseconds (1 retries)
Reset Request Timer:    18 decaseconds (1 retries)
Restart Request Timer:  18 decaseconds (1 retries)
T1 Timer: 4 seconds     N2 timeouts: 20
T2 Timer: 2 seconds     DP Timer:    500 milliseconds
Standard Version:     1984      Network Type: CCITT
Disconnect Procedure: passive
Window Size     Frame:   7      Packet:  2
Packet Size     Default: 128    Maximum: 256
```

protocols

Lists all the defined protocol configurations.

Example: **list protocols**

```
X.25 protocol configuration
Protocol       Window         Packet-Size        Idle   Max
 Number         Size          Default Maximum    Time   VCs

   0             4              128   256         10     6
   5             2              128   256         30     6
```

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.

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: **list summary**

Serial Output

```
X.25 Configuration Summary

Node Address: 23785763
Max Calls Out: 15             Inter–Frame Delay:  1
Default Window: 4             SVC idle: 25 seconds
National Personality: GTE Telenet (DTE)
PVC            low: 1  high: 2
Inbound        low: 0  high: 0
Two-Way        low: 3  high: 64
Outbound       low: 0  high: 0
Throughput Class in bps Inbound:   2400
Throughput Class in bps Outbound:  2400
```

Node Address	Displays the local X.25 interface address *(x.25-node-addr*).
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.
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 assured 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.

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.

National Disable

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**

clear-w/diag

Does not allow the clear request packets to include the diagnostic field.

Example: **national disable clear-w/diag**

flow-control-negotiation

Disables negotiation of packet and window size during call setup of SVCs.

Example: **national disable flow-control-negotiation**

frame-ext-seq-mode

Disables the frame layer from using extended sequence numbers 0 to 127. Sets the frame layer sequence numbering to 0 to 7.

Example: **national disable frame-ext-seq-mode**

multi-link-addresses

Sets the frame level addresses back to A (03) and B (01).

Example: **national disable multi-link-addresses**

osi-84

Disables CCITT OSI facilities as defined by the 1984 standard.

Example: **national disable osi-84**

osi-88

Disables CCITT OSI facilities as defined by the 1988 standard.

Example: **national disable osi-88**

packet-ext-seq-mode

Disables the packet layer from using extended sequence numbers 0 to 127. Sets the packet layer sequence numbering to 0 to 7.

Example: **national disable packet-ext-seq-mode**

packet-layer-restarts

Disables the packet layer from sending a start packet when the router restarts. The default for this feature is ON. Disable this feature only if the switch you connecting to requires that this be disabled.

Note: If this feature is disabled on both sides of the line, the line does not come up. If this feature is disabled on one side of the line, the line still comes up.

Example: **national disable packet-layer-restarts**

request-reverse-charges

Disables the requesting of reverse charges for all outgoing calls.

Example: **national disable request-reverse-charges**

reset-w/diag

Disables the inclusion of diagnostic fields in restart request packets.

Example: **national disable reset-w/diag**

restart-w/diag

Disables the inclusion of diagnostic fields in restart request packets.

Example: **national disable restart-w/diag**

suppress-calling-addresses

Disables the suppression of the source address in call packets.

Example: **national disable suppress-calling-addresses**

suppress-idle-frame-rr

Enables the sending of idle receiver ready frame layer frames.

Example: **national disable suppress-idle-frame-rr**

suppress-non-zero-cause

Disables the inclusion of non-zero values in the packet layer's cause fields.

Example: **national disable suppress-non-zero-cause**

throughput-class-negotiation

Disables the negotiation of through-put class during call setup of SVCs

Example: **national disable throughput-class-negotiation**

National Enable

Enable a feature defined in the National Personality configuration.

Syntax: national enable 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

Accepts reverse charge calls during call establishment. This option is not available for DDN.

Example: **national enable accept-reverse-charges**

ccitt

Specifies that the CCITT convention, rather than ISO convention, is followed for timer retry expiration. CCITT acts as if the confirmation packet for the restart or clear requests had arrived. ISO leaves the request unconfirmed.

Example: **national enable ccitt**

clear-w/diag

Allows clear request packets to include the diagnostic field.

Example: **national enable clear-w/diag**

flow-control-negotiation

Enables the negotiation of packet and window size during call setup of SVCs.

Example: **national enable flow-control-negotiation**

frame-ext-seq-mode

Sets the frame layer sequence numbering to modulus 128 (that is, 0 through 127).

Example: **national enable frame-ext-seq-mode**

multi-link-addresses

Allows the frame level to use addresses C (0F) and D (07) rather than A (03) and B (01).

Example: **national enable multi-link-addresses**

osi-84

Allows CCITT OSI facilities defined by the 1984 standard.

Example: **national enable osi-84**

osi-88

Allows CCITT OSI facilities defined by the 1988 standard.

Example: **national enable osi-88**

packet-ext-seq-mode

Sets the packet layer sequence numbering modulus 128 (that is, 0 through 127).

Example: **national enable packet-ext-seq-mode**

packet-layer-restarts

Specifies that the packet layer sends a restart packet when the router restarts.

Example: **national enable packet-layer-restarts**

request-reverse-charges

Requests reverse charges for all outgoing calls.

Example: **national enable request-reverse-charges**

reset-w/diag

Allows reset request packets to include the diagnostic field.

Example: **national enable reset-w/diag**

restart-w/diag

Allows restart request packets to include the diagnostic field.

Example: **national enable restart-w/diag**

suppress-calling-address

Suppresses the source address in call packets.

Example: **national enable suppresses-calling-addresses**

suppress-idle-frame-rr

Suppresses the sending of idle receiver ready frame layer frames.

Example: **national enable suppress-idle-frame-rr**

suppress-non-zero-cause

Suppresses packet layer's cause fields.

Example: **national enable suppress-non-zero-cause**

throughput-class-negotiation

Enables the registration of throughput class.

Example: **national enable throughput-class-negotiation**

National Restore

Restore one or all of the default values made to the National Personality configuration with the **national set** command, the **national enable** command, or **national disable** command.

Syntax: national restore all
accept-reverse-charges
call-req
ccitt
clear-req . . .
clear-w/diag
disconnect-procedure . . .
dp-timer
flow-control-negotiation
frame-ext-seq-mode
frame-window-size
multi-link-addresses
network-type . . .
n2-timeouts
osi-84
osi-88
packet-size . . .
packet-ext-seq-mode
packet-layer-restarts
request-reverse-charges
reset . . .
reset-w/diag
restart . . .
standard-version
suppress-calling-addresses
suppress-idle-frame-rr
suppress-non-zero-cause
throughput-class-negotiation
t1-timer
t2-timer

all

Restores all the default values to the National Personality configuration.

Example: **national restore all**

accept-reverse-charges

Restores the accept-reverse-charges feature for calls during call establishment. This option is not available for DDN.

Example: **national restore accept-reverse-charges**

call-req

Resets the number of ten second intervals permitted before clearing an unaccepted call to the national default.

Example: **national restore call-req**

ccitt

Restores the feature that specifies that the CCITT convention, rather than ISO convention, is followed for timer retry expiration. CCITT acts as if the confirmation packet for the restart or clear requests had arrived. ISO leaves the request unconfirmed.

Example: **national restore ccitt**

clear-req ***retries timer***

Resets the number of clear request transmissions (*retries*) and the number of ten second intervals (*timer*) to wait before retransmitting to the national default.

clear-w/diag

Restores the feature that allows clear request packets to include the diagnostic field.

Example: **national restore clear-w/diag**

disconnect-procedure ***passive active***

Specifies the type of disconnect procedure to use when disconnecting.

Example: **national restore disconnect–procedure**

Passive	Specifies that there are no DISC frames used when disconnecting.
Active	Specifies that there are DISC frames used when disconnecting.

dp-timer

Specifies the number of milliseconds that the frame level remains in a disconnected state. Zero indicates immediate transition from disconnected phase to link setup state.

Example: **national restore DP-timer**

flow-control-negotiation

Restores the feature that determines the frame's packet size and window size; suitable for call set-up negotiation.

Example: **national restore flow-control-negotiation**

frame-ext-seq-mode

Restores the frame layer sequence numbering modulus.

Example: **national restore frame-ext-seq-mode**

frame-window-size

Restores the default number of frames.

Example: **national restore frame-window-size**

multi-link-addresses

Restores the default value for frame layer addressing.

Example: **national restore multi-link-addresses**

network-type *CCITT DDN*

Specifies the network convention.

Example: **national restore network-type**

CCITT	Specifies the CCITT convention.
DDN	Specifies the DDN convention.

n2-timeouts

Restores the default value for the number of times the T1 timer can expire before a state change.

Example: **national restore N2-timeouts**

osi-84

Restores the default value for CCITT OSI facilities defined by the 1984 standard.

Example: **national restore osi-84**

osi-88

Restores the default value for CCITT OSI facilities defined by the 1988 standard.

Example: **national restore osi-88**

packet-size *default* OR *maximum* OR *window*

Restores the default value for these packet layer values.

Example: **national restore packet-size default**

Default	Number of bytes in the data portion of the packet. The value is restored to 128.
Maximum	Maximum number of bytes in the data portion of the packet. The value is restored to 256.
Window	Number of outstanding I-frames permitted before acknowledgement is required. The value is restored to 2.

packet-ext-seq-mode

Restores the default value for the packet layer sequence numbering.

Example: **national restore packet-seq-mode**

packet-layer-restarts

Restores the default value for packet layer sending of restart packet when the router restarts.

Example: **national restore packet-layer-restarts**

request-reverse-charges

Restores the default value for reverse charges request for all outgoing calls.

Example: **national restore request-reverse-charges**

reset ***retries timer***

Restores the default value for the number of reset retransmissions.

Example: **national restore reset**

Retries	Number of reset request transmissions permitted before the call is cleared. The range is 0 to 255.
Timer	Number of ten second intervals to wait before retransmitting a reset request packet. The range is 0 – 255. A zero in the *timer* value indicates an indefinite wait.

reset-w/diag

Restores the default feature that allows the a reset request packet to include the diagnostic field.

Example: **national restore reset-w/diag**

restart-retries

Restores the default value for the number of restart request retransmissions.

Example: **national restore restart retries**

restart-timer

Restores the timeout value for the number of restart request transmissions.

Example: **national restore restart timer**

standard-version

Restores default OSI facilities settings.

Example: **national restore standard-version**

suppress-calling-address

Restores the default value for this national personality and determines whether to enable the suppression of the source address in call packets. The default is disabled.

Example: **national restore suppress-calling-address**

suppress-idle-frame-rr

Restores the default value for this national personality and determines whether to suppress the sending idle receiver ready frame layer frames. The default is disabled.

Example: **national restore suppress-idle-frame-rr**

suppress-non-zero-cause

Restores the default value for this national personality and determines whether to suppress of the packet layer's cause fields. The default is disabled.

Example: **national restore suppress-non-zero-cause**

throughput-class-negotiation

Restores the default state (enable/disabled) determined by personality whether to negotiate the throughput class on SVC setup. The default is enable.

Example: **national restore throughput-class-negotiation**

t1-timer

Restores the default value for the frame retransmit time in seconds.

Example: **national restore T1-timer**

t2-timer

Restores the default value for the maximum number of seconds to wait before sending an I-frame received acknowledgement. This is an optimization parameter. If this value is non-zero, the router defers acknowledging received I-Frames. In this case, it expects to transmit an I-Frame that performs this acknowledgment. It can improve link utilization. It results in T2 timeouts.

Example: **national restore T2-timer**

National Set

Set one or all of the default values made to the National Personality configuration.

Syntax: national set
- call-req
- clear-req . . .
- disconnect-procedure . . .
- dp-timer
- frame-window-size
- network-type . . .
- n2-timeouts
- packet-size . . .
- reset . . .
- restart . . .

standard-version
t1-timer
t2-timer

call-req

Specifies the number of ten second intervals permitted before giving up on a call request and clearing it. A zero indicates an indefinite wait.

Example: **national set call-req**

clear-req ***retries timer***

Specifies the number of clear request retransmissions.

Retries	Number of clear request transmissions permitted before action is taken.
Timer	Number of ten second intervals to wait before retransmitting a call request packet. A zero in the *timer* value indicates an indefinite wait.

Example: **national set clear-req**

disconnect-procedure ***passive active***

Specifies the type of disconnect procedure to use when disconnecting.

Example: **national set disconnect-procedure active**

Passive	Specifies that DISC frames not are used when disconnecting.
Active	Specifies that DISC frames are used when disconnecting.

dp-timer

Specifies the number of milliseconds that the frame level remains in a disconnected state. Zero indicates immediate transition from disconnected phase to link setup state.

Example: **national set dp-timer**

frame-window-size

Specifies the number of frames that can be outstanding before acknowledgement.

Example: **national set frame-window-size**

network-type ***CCITT DDN***

Specifies the type of network being supported.

Example: **national set network-type**

CCITT	Specifies the CCITT convention.
DDN	Specifies the DDN convention.

n2-timeouts

Specifies the number of times the T1 timer can expire before a state change.

Example: **national set n2-timeouts**

packet-size ***default-size max-size window-size***

Specifies the size of the packet.

Example: **national set packet-size**

Default-size	Number of bytes in the data portion of the packet. Possible options include 128, 256, 512, 1024, 2048, and 4096. This value must be less than or equal to the maximum size. This value is used when and if flow control negotiation is enabled. *Default-size* cannot be greater than *max-size.*
Max-size	Maximum number of bytes in the data portion of the packet. Possible options include 128, 256, 512, 1024, 2048, and 4096.
Window-size	Number of outstanding I-frames permitted before acknowledgement is required. The range is 1 to 7. When extended sequence numbers are in use, the range is 1 to 127. This value is used when and if flow control negotiation is enabled.

reset ***retries timer***

Specifies the number of reset request retransmissions.

Example: **national set reset**

restart ***retries timer***

Specifies the number of restart request transmissions.

Example: **national set restart**

Retries	Number of reset request transmissions permitted before the call is cleared. The range is 0 to 255.
Timer	Number of ten second intervals to wait before retransmitting a 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 seconds.

Example: **national set t1-timer**

t2-timer

Specifies the number of seconds to wait pending I-frame acknowledge.

Example: **national set t2-timer**

Set

Configure local X.25 node addresses, maximum number of calls, frame and packet level window size, lowest to highest PVC and SVC channels, and the idle time for a switched circuit.

Syntax: set
- address . . .
- calls-out . . .
- default-window-size . . .
- equipment-type . . .
- htf addr . . .
- inter–frame–delay . . .
- max-retry . . .
- national-personality . . .
- pvc . . .
- svc low . . .
- svc high . . .
- throughput-class . . .
- vc idle . . .

address ***X.25-node-addr***

Sets the local X.25 interface address *(x.25-node-addr*). Set the X.25 node address to 0, not to 00, to delete the local X.25 address.

Example: **set address 8982800**

calls-out ***value***

Sets the maximum number of locally initiated simultaneously active SVCs. The range is 0 to 227. The default is 4.

Example: **set calls-out 3**

default-window-size ***value***

Sets the window size for the packet level assigned by the router if there is no window-size facility in the Call-Request-Packet. The range is determined by the National Personality packet modulus (PACKET-EXT-SEQ-MODE). The default is 2.

Example: **set default-window-size 3**

equipment-type ***DCE DTE***

Specifies whether the frame and packet levels act as *DCE* or *DTE*. DTE is the default setting. This has no relation to the cable type in use.

Example: **set equipment-type DCE**

hft addr ***x.25-node-addr***

Sets the local DDN X.25 address translation (*x.25-node-addr)*. Set the X.25 node address to 0, not to 00, to delete the local X.25 address.

Example: **set htf-address 11.42.0.137**

inter-frame-delay ***value***

This parameter defines the minimum delay between transmitted frames. Setting this parameter is useful when interfacing directly to older equipment that may not be able to consistently handle consecutive frames separated by one flag resulting in receive errors (for example, T1 timeouts). This parameter functions as follows:

Example: **set inter–frame–delay 1**

max-retry ***value***

Sets the maximum number (*value*) of physical layer retransmissions attempted.

Example: **set max-retry 4**

national-personality ***GTE-Telenet or DDN***

Sets the 28 default parameters for either *GTE-Telenet* or *DDN* National Personality. GTE-Telenet is the default setting.

Example: **set national-personality DDN**

pvc low/high ***value***

Defines the lowest to the highest permanent virtual circuit channel number (*value*). Zero indicates no PVCs. The default for the **PVC low** parameter is 0 and the default for **PVC high** is 0. Therefore, by default there are no PVCs. The range is of 0–4095. These values are setting the boundaries of a given VC range. The values of boundaries can range between 0 and 4095, however, the actual range is limited by memory (for example, if **set PVC low** is set to **1** and **set PVC high** is set to **4095,** these are valid boundary ranges but there is not enough memory to support this range.)

Example: **`set PVC low 40`**

svc low/high ***inbound two-way outbound***

Defines the lowest to the highest switched virtual circuit channel number (*value*).

Example: **`set SVC low two-way 1`**

Inbound	Specifies a range of 1 – 255. The default setting is 0; therefore, by default, there are no inbound only SVCs.
Two-way	Specifies a range of 1 – 255. The default setting is 1 for the **SVC low** parameter and 64 for the **SVC high** parameter. By default, there are 64 2-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**

Exit

Return to the Config> prompt.

Syntax: exit

Example: **exit**

19

Monitoring the X.25 Network Interface

This chapter describes the X.25 console commands.

For more information on X.25, refer to the *Routing Protocols Reference Guide.*

Accessing the Interface Console Process

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

X.25 Console Commands

This section summarizes and explains all the X.25 console commands. The X.25 console commands allow you to view the parameters and statistics of the interfaces and networks that transmit X.25 packets. Console commands display configuration values for the physical, frame, and packet levels. You also have the option of viewing the values for all three protocol levels at once.

Enter the X.25 console commands at the `X.25>` prompt.

Table 19–1 X.25 Console Command Summary

Console Command	Function
? (Help)	Lists all the X.25 console commands or lists the options associated with specific commands.
List	Lists individual PVC or SVC statistics and general information.
Parameters	Displays the current parameters for any level of the X.25 configuration.
Statistics	Displays the current statistics for any level of the X.25 configuration.
Exit	Exits the X.25 console process and returns to the GWCON process.

? (Help)

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

Syntax: ?

Example: **?**

```
List
Parameters
Statistics
Exit
```

List

Display the current active PVCs and SVCs.

Syntax: list pvcs
svcs

pvc

Displays the configured permanent virtual circuits.

Example: **list pvcs**

svc

Displays the active switched virtual circuits.

Example: **list svcs**

```
HCN/  Destination  Originate Transmits  Protocol    Totals
State      Address     Call   Queued  Encapsulated Xmts Rcvs Resets

13   D   898280077113   YES     0          IP      8943  261
1 20 D   898280077114    NO     0          IP       943   43
0 40 D   898280077115   YES     0          DN       567  104
0 42 P   898280077116   YES     6          IP         0    0
0 23 C   898280077117   YES     0          IP      3054   110   0

D  – Data Transfer      P  – Call Progressing
C  – Call Clearing
```

Parameters

Use the **parameters** command to display the current parameters for any level of the X.25 configuration.

Syntax: parameters all
frame
packet
physical

all

Displays the parameters for the packet, frame, and physical levels.

Example: **parameters all**

frame

Displays the parameters for the frame level.

Example: **parameters frame**

```
Frame Layer Parameters:
  Maximum Frame Size  = 262 Maximum Window Size  =     7
  Protocol Enabled    = YES Equipment Type       =   DTE
  T1 Retransmit Timer =   4 T2 Acknowledge Timer =     2
  N2 Retry Counter    =  20 Disconnect Procedure = PASSIVE
  Disconnect Timer    = 500 Network Type         =   GTE

  Protocol Options: Inhibit Idle RRs NO  MOD 128      NO
                    A/B Addressing  YES  Enable SARM  NO
```

packet

Displays the parameters for the packet level.

Example: **parameters packet**

```
Packet Layer Parameters:
  Default Packet Size = 128  Maximum Packet Size =   256
  Log 2 Packet size   =   2  Acknowledge Delay  =     0
  Layer Enabled       = YES Default Window Size =     2
  Lowest SVC          =   1  Highest SVC        =    64
  Lowest PVC          =   0  Highest PVC        =     0
  Clear Diagnostic    = YES  Reset Diagnostic   =   YES
  Restart Diagnostic  = YES  T21 (Call)         =    20
  T20 (Restart)       = 18  R20 (Retry)         =     1

  T22 (Reset)         = 18  R22 (Retry)         =     1
  T23 (Clear)         = 18  R23 (Retry)         =     1

           Network Type        = GTE  Equipment Type     =    DTE
```

physical

Displays the parameters for the physical level.

Example: **parameters physical**

```
Physical Layer Parameters:
  Interface Type      =    RS-449

  Maximum Frame Size  =  1030   InterFrame Delay    =        0
  Configured Speed    =     0   Clocking           = External
  Protocol Enabled    =   YES
```

Statistics

Display the current statistics of any level of the X.25 configuration.

Syntax: statistics all
frame
packet
physical

all

Displays the statistics for the packet, frame, and physical levels.

Example: **statistics all**

frame

Displays the statistics for the frame level.

Example: **statistics frame**

```
Frame Layer Counters:      Received             Transmitted
  Information Frames              0                       0
  RR Command                      0                       0
  RR Response                     0                       0
  RNR Command                     0                       0
  RNR Response                    0                       0
  REJ Command                     0                       0
  REJ Response                    0                       0
  SABM                            0                      71
  SABME                           0                       0
  UA                              0                       0
  DISC                            0                       0
  DM                              0                       0
  FRMR                            0                       0

  T1 Timeouts   0   T2 Timeouts         0   N2 Timeouts   1
  Bad Address   0   Unsolicited F-Bit   0   Invalid Ctl   0

Frame Layer Miscellaneous:
 Queued Output Frames = 0 Protocol Layer State = Link Setup
 Send Sequence N(S)   = 0 Receive Sequence N(R)= 0
```

packet

Displays the statistics for the packet level.

Example: **statistics packet**

```
   Packet Counters:           Received             Transmitted
     Call Request                    0                       0
     Call Accepted                   0                       0
     Clear Request                   0                       0
     Clear Confirm                   0                       0
     Interrupt Request               0                       0
     Interrupt Confirm               0                       0
     RR Packet                       0                       0
     RNR Packet                      0                       0
     REJ Packet                      0                       0
     Reset Request                   0                       0
     Reset Confirm                   0                       0
     Restart Request                 0                       0
     Restart Confirm                 0                       0
     Diagnostic                      0                       0
     Data Packet                     0                       0
     Data Bytes                      0                       0
     Buffers Queued                  0                       0
     Invalid Packets Received =      0
     Switched Circuits Opened =      0
```

physical

Displays the statistics for the physical level.

Example: **statistics physical**

```
X.25 Physical Layer Counters:
  Rx Bytes                     23   Tx Bytes                   300

  Adapter cable:         RS-449 DTE  RISC Microcode Revision:           2

  Line speed:              19.2kbs
  Last port reset:         4 hours, 24 minutes, 20 seconds ago

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

Exit

Return to the previous prompt level.

Syntax: exit

Example: **exit**

X.25 Network Interfaces and the GWCON Interface Command

While X.25 interfaces have their own console processes for monitoring purposes, bridging routers also display complete statistics for installed network interfaces when you use the **interface** command from the GWCON environment. (For more information on the **interface** command, refer to the GWCON chapter in this guide.)

Statistics Displayed for X.25 Interfaces

The following statistics display when you run the **interface** command from the GWCON environment for X.25 interfaces:

```
Nt Nt' Interface      CSR  Vec     Passed     Failed       Failed
1  1   X25/0      1001620   5D          0          0            0

  X.25 MAC/data-link on SCC Serial Line interface
Interface State:  DCD  CTS   Packet Layer    Frame Layer   RomRev  0.0
                  OFF  OFF       DOWN           DOWN       X25Rel  3.7

Packet Counters:           Received             Transmitted
  Data Packet                     0                       0
  Data Bytes                      0                       0
  Buffers Queued                  0                       0
  Invalid Packets Received =      0
  Switched Circuits Opened =      0



Frame Layer Counters:      Received             Transmitted
  Information Frames              0                       0

X.25 Physical Layer Counters:
  Rx Bytes                        0   Tx Bytes            0

  Adapter cable:            RS-232 DTE  RISC Microcode Revision:     2


   V.24 circuit: 105 106 107 108 109
   Nicknames:    RTS CTS DSR DTR DCD
   RS-232:       CA  CB  CC  CD  CF
   State:        --- ON  --- --- ON

  Line speed:              unknown
  Last port reset:         2 minutes, 16 seconds ago
```

```
Input frame errors:
 CRC error                    0   alignment (byte length)           0
 missed frame                 0   too long (>     0 bytes)          0
 aborted frame                0   DMA/FIFO overrun                  0
 L & F bits not set           0
Output frame counters:
 DMA/FIFO underrun errors     0   Output aborts sent                0
Interface buffer pool: Total = 30, Free = 30
+
```

The following table describes these general interface statistics:

Nt	Global interface number
Nt ’	Reserved for future dial circuit use
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.

20

Configuring the WAN-restoral Interface

This chapter describes the WAN-restoral configuration commands.

Accessing the Interface Configuration Environment

To enter configuration commands, you must access the interface configuration process. For information on how to access the interface configuration environment, refer to Chapter 1.

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

Basic Configuration Requirements

The following are WAN restoral requirements:

- You must have a switched WAN link. Currently, V.25 *bis* is the only option. For V.25 *bis* configuration, refer to the chapter "Configuring the V.25 *bis* Interface."
- WAN-restoral only works on Point-To-Point Protocol or Serial Link Protocol.
- You must have a dial circuit configured to run the same link layer protocol as the primary, mapped to the switched WAN interface.
- The dial circuit configuration idle timer *must* be 0 (zero).

Basic Configuration Procedure

This section describes the minimum configuration required to get the WAN restoral interface up and running. Before beginning any configuration procedure, use the **list device** command at the `Config>` prompt to list the interface numbers of different devices. At the `Config>` prompt, select the interface you want to configure by entering: **`network`** <interface number>.

Note: When you change the configuration, you must restart the router in order to activate the revised configuration parameters.

The following provides you with a general overview of tasks needed to configure WAN ReStoral (WRS). It assumes that the secondary is a dial circuit running Serial Protocol, the primary is a leased line running Serial Protocol, and there is a V.25 *bis* base interface for the dial circuit.

1. Add a secondary interface
2. Add a primary interface
3. Enable a secondary interface
4. Enable WAN-restoral

Secondary Dial Circuit Configuration

You must have a dial circuit running the same data link (that is, Serial Link or Point-to-Point Protocol (PPP)) to the same destination as the primary mapped to a switched WAN interface. Access the configuration console at the `Config>` prompt by entering: **network** <interface number>. The following **set** commands are used at the `Circuit Config>` prompt. To configure a dial circuit, proceed as follows:

1. Configure the secondary (dial circuit) to have the same data link type as the primary (Point-to-Point Protocol or Serial Link) from the top level `Config>` prompt as follows:

```
Config>set data
```

2. Enter the interface number. For example:

```
Interface Number [0]? 3
```

3. Configure the circuit configuration as follows:

```
Config>net  1
```

4. Set the dial circuit idle timer to 0 (0=active) as follows:

```
Circuit Config>set idle 0
```

5. Set one end of the backup connection to receive calls (for example, router A) as follows:

```
Circuit Config>set calls inbound
```

6. Set the other end of the backup connection to initiate calls (for example, router B) as follows:

```
Circuit Config>set calls outbound
```

Notes: Do not use the **set calls both** command. By setting these individually, it helps prevent the collisions of incoming and outgoing connection attempts.

Do not configure any forwarder (for example, IP, IPX) addresses on the V.25 *bis* interface or the dial circuit. The protocol assignments for the primary are used on the secondary (dial circuit) when it is active.

For V.25 *bis* configuration, refer to the chapter "Configuring the V.25 *bis* Interface."

WAN-restoral Configuration Commands

The WAN-restoral configuration commands allow you to create or modify the restoral interface configuration. This section summarizes and explains the restoral configuration commands.

Table 20–1 lists WAN-restoral configuration commands and their function. Enter these commands at the `WRS Config>` prompt. Access the WAN-restoral Configuration by entering the **feature wrs** command at the `Config>` prompt.

Table 20–1 WAN-restoral Configuration Commands Summary

Command	Function
? (Help)	Lists the configuration commands or lists any parameters associated with that command.
Add	Adds a mapping of primary to secondary backup.
Disable	Disables WRS, or an individual secondary-circuit mapping.
Enable	Enables WRS, or an individual secondary-circuit mapping.
List	Displays the current Restoral configuration.
Remove	Removes a primary to secondary mapping created by add.
Exit	Exits the WAN-restoral configuration process.

? (Help)

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

Syntax: ?

Example: **?**

```
ADD
REMOVE
DISABLE
ENABLE
LIST
EXIT
```

Add

Identify a secondary backup dial circuit for a particular primary serial link.

Syntax: add secondary-circuit

secondary-circuit

The **add secondary-circuit** command binds a secondary interface to a primary interface. Both interfaces must have previously been configured. You can only assign one secondary interface to a primary and vice-versa.

Example: **add secondary-circuit**

```
WRS Config>add secondary-circuit
Secondary interface number  [0]? 3
Primary interface number  [0]? 0
```

Secondary interface number	This is the dial circuit interface number previously assigned to the secondary interface when the device was added. Any dial circuit is an eligible secondary. The default is 0.
Primary interface number	This is the interface number of the primary interface previously assigned when the device was added. A primary interface can be any previously defined leased-line running Serial Link or Point-to-Point Protocol (PPP). The default is 0.

Disable

Disable the WAN Restoral functionality or to disable the restoral of a particular primary interface by its associated secondary interface.

Syntax: disable secondary-circuit
wrs

secondary-circuit

Disables the restoral of a particular primary interface by its associated secondary interface until the next **enable secondary** command at the WRS console if the interfaces were previously configured and bound together in the WRS configuration.

Example: **disable secondary-circuit**

```
WRS Config>disable secondary-circuit
Secondary interface number  [0]? 3
```

Secondary interface number	This is the number of the secondary interface previously configured with the **add secondary** command. The default is 0.

wrs

Disables the functionality of the WAN-restoral feature globally for the router.

Example: **disable wrs**

Enable

Enable the WAN-restoral interface functionality or enable the restoral of a particular primary interface by its associated secondary interface.

Syntax: enable secondary-circuit
wrs

secondary-circuit

Enables the restoral of a primary link by the indicated secondary link.

Example: **enable secondary-circuit**

```
WRS Config>enable secondary-circuit
Secondary interface number  [0]? 3
```

Secondary interface number	This is the number of the secondary interface previously configured with the **add secondary** command. The default is 0.

wrs

Enables the functionality of the WAN-restoral feature on the router.

Example: **enable wrs**

```
WRS Config>enable wrs
```

List

Display configuration information on restored circuits. This command allows the console operator to query statistical information about each configured primary to secondary circuit binding.

Syntax: list

Example: **list**

```
WAN Restoral is enabled.

                                                  Restoral
  Primary Interface        Secondary Interface     Enabled
-----------------------    ----------------------   ---------
0 – Serial Line            3 – Dial Circuit           Yes
```

Primary Interface	This is the interface number and underlying device type.
Secondary Interface	This is the interface number and underlying device type.
Restoral Enabled	Indicates whether or not the restoral mapping is enabled. Enabled can be either Yes or No. The default is No. (Note that when the secondary is initially added, the restoral is not enabled.)

Remove

Delete the mapping of a secondary (backup) interface to the primary interface.

Syntax: remove secondary-circuit

secondary-circuit

Removes the mapping of a secondary (backup) interface to the primary interface if the interfaces were previously assigned and bound together using the **add secondary-circuit** command**.**

Example: **remove secondary-circuit**

```
WRS Config>remove secondary-circuit
Secondary interface number  [0]? 3
Primary interface number  [0]? 0
```

Secondary interface number	This is the number of the secondary interface previously configured with the **add secondary** interface command. The default is 0.
Primary interface number	This is the interface number of the primary interface previously bound to the secondary being removed. The default is 0.

Exit

Return to the `Config>` prompt.

Syntax: exit

`Example:` **`exit`**

21

Monitoring the WAN-restoral Interface

This chapter describes how to monitor the WAN-restoral interface in the router by using either the interface console commands or the GWCON **interface** command.

Accessing the Interface Console Environment

To enter configuration commands, you must access the interface configuration process. For information on how to access the interface configuration environment, refer to Chapter 1.

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

WAN-restoral Console Commands

The restoral console commands allow you to monitor the state of the restoral secondary and primary interfaces protected by WRS. Any modifications to the operational state of WRS made through the console interface are not maintained across restarts. This section summarizes and explains the restoral console commands. Access the WAN-restoral console at the + prompt by entering: **feature wrs**.

Table 21–1 lists restoral console commands and their function. These commands are used at the `WRS>` prompt.

Table 21–1 WAN-restoral Console Commands Summary

Command	Function
? (Help)	Lists the monitoring commands or lists any parameters associated with that command.
Clear	Clears the monitoring information/statistics on all restoral circuits.
Disable	Disables the WRS, or an individual secondary.
Enable	Enables the WRS, or an individual secondary.
List	Displays the monitoring information on one or all restored circuits.
Exit	Returns to the previous prompt level.

? (Help)

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

Syntax: ?

Example: **?**

```
CLEAR
DISABLE
ENABLE
LIST
EXIT
```

Clear

Clear WRS statistics.

Syntax: clear

Example: **clear**

Note: This command does not clear the “Most recent restoral period” but does clear the “Longest restoral period.” For the screen display, refer to the example in the **list** command.

Disable

Disable the WAN Restoral feature completely or to disable the restoral of a particular primary interface by its associated secondary interface.

Syntax: disable secondary-circuit
wrs

secondary-circuit

Disables the restoral of a particular primary interface by its associated secondary interface until the next restart, reload, or **enable secondary** command if both interfaces were previously configured and bound together in the WRS configuration.

Note: Normally, in task 5 (console), the **disable** command causes the interface to be inactive and stay inactive. In the case of a WAN-restoral secondary, this is not the case. The **disable** command to the secondary does not disable the interface itself. It only disables the current call (for example, causes any active V.25 *bis* call to be hung up). To disable use of the secondary circuit, you need to DISABLE SECONDARY in the WAN restoral menu and also in the console process.

Example: **disable secondary-circuit**

```
WRS>disable secondary-circuit
Secondary interface number  [0]? 3
```

Secondary interface number	This is the number of the secondary interface previously configured with the **add secondary** command. The default is 0.

wrs

Disables WAN-restoral on the router until the next restart, reload or enable WAN-restoral command.

Example: **disable wrs**

Enable

Enable the WAN Restoral interface functionality or enable the restoral of a primary link by a secondary circuit.

Syntax: enable secondary-circuit
wrs

secondary-circuit

Enables the restoral of a primary link by the indicated secondary link.

Example: **enable secondary-circuit**

```
WRS>enable secondary-circuit
Secondary interface number  [0]? 3
```

Secondary interface number	This is the number of the secondary interface previously configured with the **add secondary** command. The default is 0.

wrs

Enables the functionality of the WAN-restoral feature on the router.

Example: **enable wrs**

List

Display monitoring information on one or all restored circuits.

Syntax: list all
secondary-circuit
summary

all

Provides summary information, followed by the specific information for each secondary.

Example: **list all**

```
WAN Restoral is enabled with 1 circuit(s) configured

 Total restoral attempts =          3 completions =        2
 Total packets forwarded =          346

 Longest restoral period in hrs:min:sec        00:08:20

                                                  Restoral
  Primary Interface       Secondary Interface     Enabled
----------------------   ----------------------   ---------
 0 – Serial Line         3 – 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
```

Total restoral attempts	The number of times the primary failed, causing the router to try to bring up a secondary link.
Completions	The number of successful restoral attempts when the secondary came up and was used.
Total packets forwarded	The total number of packets forwarded across the secondary interface. It is the sum of both directions, and is cumulative over all successful restores, until restart or the **clear restoral-statistics** command is issued.
Longest restoral period	This field displays in hours, minutes, seconds the longest amount of time a restoral was in operation not counting any current usage.
Primary Interface	The interface that is being backed up by its associated secondary.
Secondary Interface	The dial circuit that is being used to backup the associated primary.
Restoral Enabled	Indicates that a restoral of this primary is currently enabled.

Router primary Interface state

Indicates that the primary interface state is one of the following:

- **Up** – Indicates that the link is up.
- **Down** – Indicates that the link is down.
- **Disabled** – Indicates that the operator has disabled the link.
- **Not present** – Indicates that the link is configured but there is a hardware problem.

Router secondary Interface state

Indicates that the associated secondary interface state is one of the following:

- **Up** – Indicates that the link is up.
- **Down** – Indicates that the link is down. This also occurs when the base network for the secondary is disabled either at the `Config>` prompt or at the operator console.
- **Available** – Indicates that the link is in the waiting mode.

Restoral Statistics:

Primary Restoral Attempts

Indicates the number of times the primary failed, causing the router to try to bring up this secondary link.

Restoral Packets forwarded

Indicates the total number of packets forwarded.

Most recent Restoral Period

Indicates how long the secondary was up, the last time it was used, or currently in use.

secondary-circuit

Provides totals for each secondary circuit. Allows the console operator to retrieve the WAN-restoral state and associated statistics for each secondary and its associated primary mapping.

Example: **list secondary-circuit**

```
Secondary interface number  [0]? 1

                                                 Restoral
 Primary Interface       Secondary Interface     Enabled
------------------------ ----------------------  ---------
 0 – Serial Line         3 – 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
```

Primary Interface	The interface that is being backed up by this associated secondary.
Secondary Interface	The dial circuit that is being used to backup the associated primary.
Restoral Enable	Indicates whether restoral of this primary is currently enabled.

Router primary Interface state

Indicates that the primary interface state is one of the following:

- **Up** – Indicates that the link is up.
- **Down** – Indicates that the link is down.
- **Disabled** – Indicates that the operator has disabled the link.
- **Not present** – Indicates that the link is configured but there is a hardware problem.

Router secondary Interface state

Indicates that the associated secondary interface state is one of the following:

- **Up** – Indicates that the link is up.
- **Down** – Indicates that the link is down. This also occurs when the base network for the secondary is disabled either at the `Config>` prompt or at the operator console.
- **Available** – Indicates that the link is in the waiting mode.
- **Testing** – Indicates that the link is in the process of establishing a connection.

Restoral Statistics:

Primary Restoral Attempts

Indicates the number of times the primary failed, causing the router to try to bring up a secondary link.

Restoral Packets forwarded

Indicates the total number of packets forwarded.

Most recent Restoral Period

Indicates how long the secondary was up, the last time it was used or during the current restoral use.

summary

Provides totals for each secondary circuits.

Example: **list summary**

```
WAN Restoral is enabled with 3 circuit(s) configured

Total restoral attempts =             3 completions =      2
Total packets forwarded =           346

Longest restoral period in hrs:min:sec         00:08:20
Primary Interface and State   Secondary Interface and State
---------------------------   ---------------------------------
0  SL/0  – Up                 3  SL/1  – Available
```

Total restoral attempts	The number of times the primary failed, causing the router to try to bring up a secondary link.
Completions	The number of successful restoral attempts when the secondary came up and was used.
Total packets forwarded	The total number of packets forwarded across the secondary interface. It is the sum of both directions, and is cumulative over all restoral periods until restart or the **clear restoral-statistics** command is used.
Longest restoral period	This field displays in hours, minutes, seconds the longest amount of time restoral was in use, not counting the current usage.
Primary Interface and State	The interface that is being backed up by its associated secondary. Valid states are: • **Up** – Indicates that the link is up. • **Down** – Indicates that the link is down. • **Disabled** – Indicates that the operator has disabled the link. • **Not present** – Indicates that the link is configured but there is a hardware problem.

Secondary Interface and State	The dial circuit that is being used to backup the associated primary. Valid states are: • **Up** – Indicates that the link is up. • **Down** – Indicates that the link is down. This also occurs when the base network for the secondary is disabled either at the `Config>` prompt or at the operator console. • **Testing** – Indicates that the link is in the process of establishing a connection. • **Available** – Indicates that the link is in the waiting mode.

Exit

Return to the GWCON (+) prompt.

Syntax: exit

Example: **exit**

A

X.25 National Personalities

This appendix lists the default settings for GTE-Telenet and DDN.

GTE-Telenet

The following parameters are the default settings for GTE-Telenet:

- Call-req: 20
- Clear-req:
  - Retries: 1
  - Timer: 18
- Disconnect: Passive
- DP-timer: 500 milliseconds
- Frame window size: 7
- Network Type: CCITT
- N2 timeouts: 20
- Packet:
  - Default size: 128
  - Maximum size: 256
  - Window size: 2

- Reset
  - Retries: 1
  - Timer: 18
- Restart
  - Retries: 1
  - Timer: 18
- Standard: 1984
- T1-timer: 4
- T2-timer: 2

DDN

The following parameters are the default settings for DDN:

- Call-req: 20
- Clear-req:
  - Retries: 1
  - Timer: 18
- Disconnect: Passive
- DP-timer: 500 milliseconds
- Frame window size: 7
- Network Type: CCITT
- N2 timeouts: 20
- Packet:
  - Default size: 128
  - Maximum size: 256
  - Window size: 2

- Reset
  - Retries: 1
  - Timer: 18
- Restart
  - Retries: 1
  - Timer: 18
- Standard: 1984
- T1-timer: 4
- T2-timer: 2

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