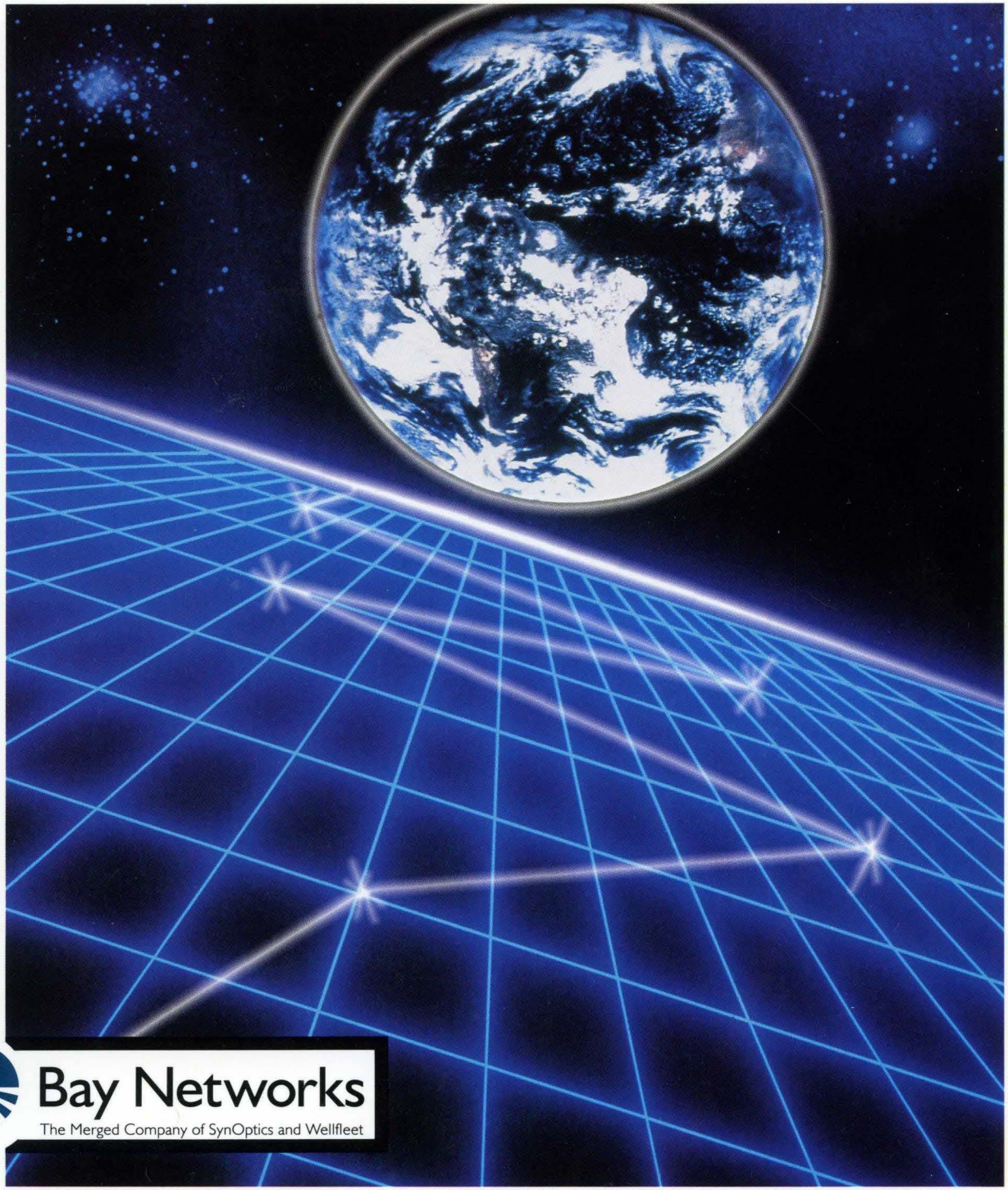

Bay Networks

The Merged Company of SynOptics and Wellfleet

Customizing Data Compression Services

Part No. 110056 A

Customizing Data Compression Services

Router Software Version 8.10
Site Manager Software Version 2.10

Part No. 110056 Rev. A
February 1995

Bay Networks

The Merged Company of SynOptics and Wellfleet

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Contents

Chapter 1
Data Compression Overview

Data Compression Architecture 1-1
LZ-77 Algorithm 1-2
Compression Control Protocol (CCP) 1-2
Wellfleet Compression Protocol (WCP) 1-2
How Data Compression Works 1-2
CCP Negotiations 1-4
WCP Negotiations 1-4
Compression Mode 1-4
History Size 1-5
Buffer Size 1-6
Data Transmission 1-6

Chapter 2
Implementation Notes

PPP Compression 2-1
PPP Dial-on-Demand and Dial Backup Services 2-2

Chapter 3
Editing Data Compression Parameters

Enabling Data Compression 3-2

Editing WCP Parameters 3-3

Editing WCP Line Parameters 3-4

WCP Line Parameter Descriptions 3-5

Editing WCP Interface Parameters 3-8

WCP Interface Parameter Descriptions 3-9

Deleting Data Compression from a Router 3-12

Index

Figures

Figure 1-1. CCP, WCP, and NCP Initialization 1-3
Figure 3-1. Select Protocols Window 3-2
Figure 3-2. Configuration Manager Window 3-3
Figure 3-3. WCP Line Interfaces List 3-4
Figure 3-4. WCP Circuit Interfaces List 3-8

About This Guide

If you are responsible for configuring and managing Wellfleet® routers running over Point-to-Point links, you need to read this guide.

This guide describes Wellfleet data compression services and provides instructions for using Site Manager to configure Wellfleet Compression Protocol (WCP) parameters for your network.

Refer to this guide for

- An overview of data compression services (Chapter 1)
- Information about our implementation of compression services (Chapter 2)
- Descriptions of WCP parameters and instructions for editing those parameters (Chapter 3)

For information and instructions about the following topics, see *Configuring Wellfleet Routers*.

- Initially configuring and saving an WAN interface
- Retrieving a configuration file
- Rebooting the router with a configuration file

Before You Begin

Before using this guide, you must complete the following procedures:

- Create and save a configuration file that contains at least one PPP interface.
- Retrieve the configuration file in local, remote, or dynamic mode.

Refer to *Configuring Wellfleet Routers* for instructions.

How to Get Help

For additional information or advice, contact the Bay Networks Help Desk in your area:

United States	1-800-2LAN-WAN
Valbonne, France	(33) 92-966-968
Sydney, Australia	(61) 2-903-5800
Tokyo, Japan	(81) 3-328-0052

Conventions

arrow character (→)	Separates menu and option names in instructions. Example: Protocols→AppleTalk identifies the AppleTalk option in the Protocols menu.
italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
`screen text`	Indicates data that appears on the screen. Example: `Set Trap Monitor Filters`
quotation marks (" ")	Indicate the title of a chapter or section within a book.
vertical line (|)	Indicates that you enter only one of the parts of the command. The vertical line separates choices. Do not type the vertical line when entering the command. Example: If the command syntax is **show at routes | nets**, you enter either **show at routes** or **show at nets**, but not both.

Acronyms

CCP	Compression Control Protocol
CPC	Continuous Packet Compression
CRC	cyclic redundancy check
LCP	Link Control Protocol
MIB	Management Information Base
NCP	Network Control Protocol
PPC	Packet-by-Packet Compression
PPP	Point-to-Point Protocol
RFC	Request for Comments
TI	Technician Interface
VC	virtual circuit
WAN	wide area networks
WCP	Wellfleet Compression Protocol

Chapter 1
Data Compression Overview

Wellfleet data compression software enables you to reduce line costs and improve response times over wide area networks running Point-to-Point Protocol (PPP).

Wellfleet data compression eliminates redundancies in data streams. When you use compression on your network, bandwidth efficiency improves, and you can transmit more data over a given amount of network bandwidth.

To implement compression, you must make decisions about how much memory to allocate to this task. The goal is to compress data as much as possible without unduly taxing the resources of the router.

Data Compression Architecture

Wellfleet routers use the following algorithm and protocols to provide data compression services:

- LZ-77 algorithm
- Compression Control Protocol (draft RFC)
- Wellfleet Compression Protocol (WCP)

LZ-77 Algorithm

We base our data compression services on a Lempel-Ziv (LZ-77) algorithm. The algorithm uses a sliding history buffer that stores the data that the network link has processed most recently. The compressor compares new data strings with data it has already processed and stored in the buffer. When the compressor detects redundant strings it replaces those strings with offset and length tokens that are shorter than the original strings, and thus compresses the data.

Compression Control Protocol (CCP)

Wellfleet routers use the draft RFC Compression Control Protocol (CCP) only to enable or disable compression.

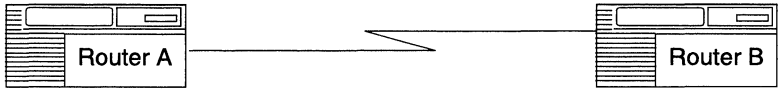
The draft RFC for CCP also includes a history reset request and acknowledgment capability, but the our implementation of data compression does not use these features.

Wellfleet Compression Protocol (WCP)

Wellfleet Compression Protocol is a transfer protocol for transporting compressed packets. WCP negotiates compression mode, history size, and buffer size. WCP also retransmits packets in the event of packet loss, and provides protection from inadvertent data expansion.

How Data Compression Works

The following sections provide descriptions of how Wellfleet data compression works. As you read these sections, refer to Figure 1-1, which illustrates CCP and WCP initialization.



1. PPP interface on network; LCP negotiations complete; begin CCP negotiations:

   Send Initialization-Request →
   ← Send Initialization-Request
   Send Initialization-ACK →
   ← Send Initialization-ACK

2. CCP negotiations complete; begin WCP negotiations, including compression mode, history size, and buffer size:

   Send Initialization-Request →
   ← Send Initialization-Request
   Send Initialization-ACK →
   ← Send Initializaiton-ACK

3. WCP negotiations complete; begin NCP negotiations:

   Send Configure-Request →
   ← Send Configure-Request
   Send Configure-ACK →
   ← Send Configure-ACK

4. NCP open; begin transmitting data:

   ← Send Data →

Figure 1-1. CCP, WCP, and NCP Initialization

CCP Negotiations

CCP allows the two ends of a PPP connection to negotiate whether to use data compression, and if so, which algorithm to use. Our implementation of compression uses only the LZ-77 algorithm.

Note: If one side of a link requests an algorithm that the other side does not support, traffic over the link continues, but in uncompressed form.

Negotiations begin when PPP establishes a link. CCP uses the same configuration and network control protocol negotiations that Link Control Protocol (LCP) uses. For a detailed explanation of LCP negotiations, see "Establishing the PPP Link" in *Customizing PPP Services.*

WCP Negotiations

Each side of a PPP link running data compression has a compressor, a decompressor, a compression history, and a buffer. When you configure compression, you must set WCP parameters for compression mode, history size, and buffer size.

Compression Mode

You can compress data in one of two modes:

- Continuous Packet Compression (CPC) maintains compression history across packets. Using CPC yields a higher *compression ratio* than does Packet by Packet. Compression ratio is the size of uncompressed data compared to the size of that same data after it has been compressed.
- Packet-by-Packet Compression (PPC) creates a new history for each packet. Using PPC yields a lower compression ratio than does CPC.

In most circumstances you should select CPC to maximize compression.

Select PPC only for links that drop a very large number of packets. Be aware that under these circumstances, implementing data compression may offer marginal or no advantages.

If either side of the link specifies PPC, both sides of the link use PPC.

History Size

Each side of the link maintains both compression and decompression histories and lookup tables. The compression and decompression histories maintain a record of data that has already traveled across the network. The lookup tables maintain a record of redundant strings and the offset and length tokens that replace each of those strings.

You can allocate either 8 KB or 32 KB of local memory to maintain a compression history. To maximize compression, accept the default, 32 KB.

If the link uses a compression history of 8 KB, each end of the link allocates 8 KB of memory for compression, 16 KB for a compression lookup table, and 8 KB for decompression. If the link uses a compression history of 32 KB, each end of the link allocates 32 KB of memory for compression, 64 KB for a compression lookup table, and 32 KB for decompression.

If you select different values for history size for the two sides of the link, the smaller of the two sizes becomes the history size for the link.

The choice is not as critical in the case of PPP, which allows only one circuit per line, as it is in the case of other protocols that allow many virtual circuits (VCs) per line, and therefore require more careful allocation of memory.

Select 8 KB or 32 KB for history size, based on the amount of memory you want each end of the link to allocate for this process.

Buffer Size

Buffer size is the amount of memory at the compressor that keeps the transmission history. You can select a buffer size of None, Normal, Large, or Very Large. The default value is Normal. Configure buffer space based on the following conditions:

- Length of time it takes for data to travel over the link

  A Normal buffer size usually suffices for a coast-to-coast connection within the United States. You may need a Large or Very Large buffer if your link is over a satellite connection.

- Number of dropped packets

  Increase the buffer size on a link with a large number of dropped packets.

  Decrease the buffer size, even to None, to conserve memory on a link with a very small number of dropped packets.

- Number of resets

  Increase the buffer size for a link with a large number of resets and a low number of dropped packets. Be aware, however, that a high number of resets may occur for reasons unrelated to buffer size.

Data Transmission

When WCP negotiations are complete, Network Control Protocol (NCP) negotiations occur. When NCP negotiations are complete, data transmission using compression begins.

Chapter 2
Implementation Notes

This chapter provides information on special features of the Bay Networks data compression implementation.

PPP Compression

Wellfleet data compression software works over wide area network links running Point-to-Point Protocol (PPP). It includes the following features:

- One WCP circuit per configured line
- Compression for a FRE module at 4x128 KB/s compressed throughput, full duplex; or 512 KB/s aggregate compressed throughput
- Compression on an AN platform at 2x64 KB/s compressed throughput, full duplex; or 128 KB/s aggregate compressed throughput
- Compression on all interface modules (ILIs) that support serial and ISDN BRI ports
- Compression support for all Wellfleet router platforms: AN, ASN, and BN, plus VME
- Compression configurable on a per-circuit or line basis

We do not support header compression or compression over multiline.

PPP Dial-on-Demand and Dial Backup Services

PPP allows you to configure dial-on-demand and backup services.

Dial-on-demand enables you to establish a circuit only when you want to transmit and receive data, as opposed to having a leased line, which is always available. By using a circuit on a demand basis, you can significantly reduce your line costs.

PPP also allows you to configure a dial backup feature. If a primary PPP line fails and you have enabled dial backup, the router automatically establishes a backup line.

You can use data compression on dial-on-demand and dial backup circuits. When you enable compression on a dial-on-demand or dial backup circuit, WCP automatically configures or deletes compression as lines are added to or removed from the circuit.

For further information on enabling compression for dial-on-demand and dial backup lines, see *Customizing Dial Services.* After you have enabled compression, you edit compression parameters by following the directions in this manual.

Chapter 3
Editing Data Compression Parameters

This chapter provides information about customizing data compression parameters for the PPP interfaces you configure on the router.

Note: You must configure at least one PPP interface on the router to enable data compression and edit data compression parameters. If you do not know how to configure a PPP interface, see *Configuring Wellfleet Routers.*

For each WCP parameter that you configure, this chapter provides descriptions of the default setting, all valid setting options, the parameter function, instructions for setting the parameter, and the Management Information Base (MIB) object ID.

The Technician Interface (TI) allows you to modify parameters by issuing **set** and **commit** commands with the MIB object ID. This process is equivalent to modifying parameters using Site Manager. For more information about using the Technician Interface to access the MIB, refer to *Using Technician Interface Software.*

Enabling Data Compression

You enable data compression from the Select Protocols window that pops up after you have selected PPP from the WAN Protocols window (Figure 3-1).

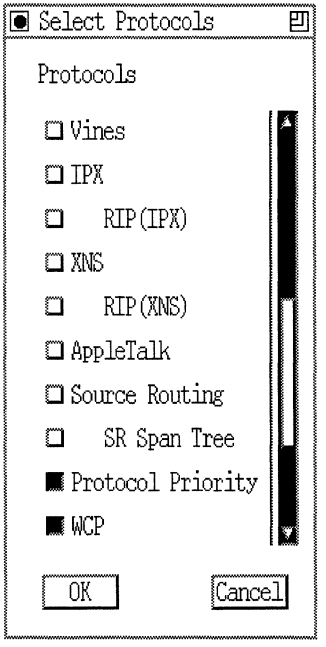


Figure 3-1. Select Protocols Window

1. Scroll through the list to select WCP (Wellfleet Compression Protocol). You may also select other protocols you want to configure.
2. Click on OK to implement compression and exit the window.

Editing WCP Parameters

After you enable compression, you can edit all data compression parameters from the Configuration Manager window (Figure 3-2). Refer to *Configuring Wellfleet Routers* for instructions on using Site Manager to access this window.

Since PPP allows only one circuit per line, you can configure most PPP WCP parameters by selecting either Protocols→WCP→Lines or Protocols→WCP→Interfaces. The only parameter that does not appear in both places is Buffer Size, which is a line parameter only.

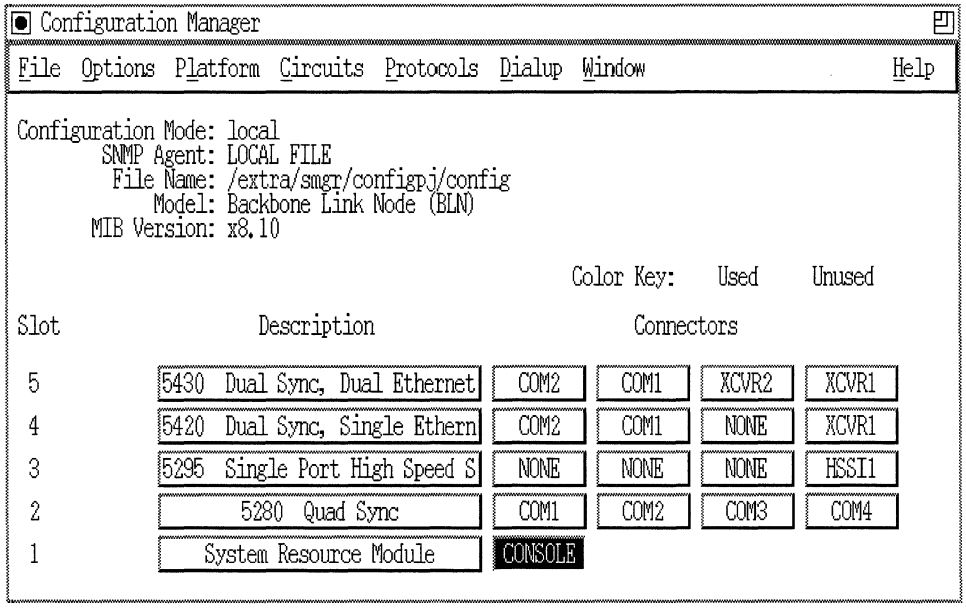


Figure 3-2. Configuration Manager Window

Editing WCP Line Parameters

To edit WCP line parameters, begin at the Configuration Manager window (refer to Figure 3-2) and proceed as follows:

1. Select Protocols→WCP→Lines.

The WCP Line Interfaces List window appears (Figure 3-3).

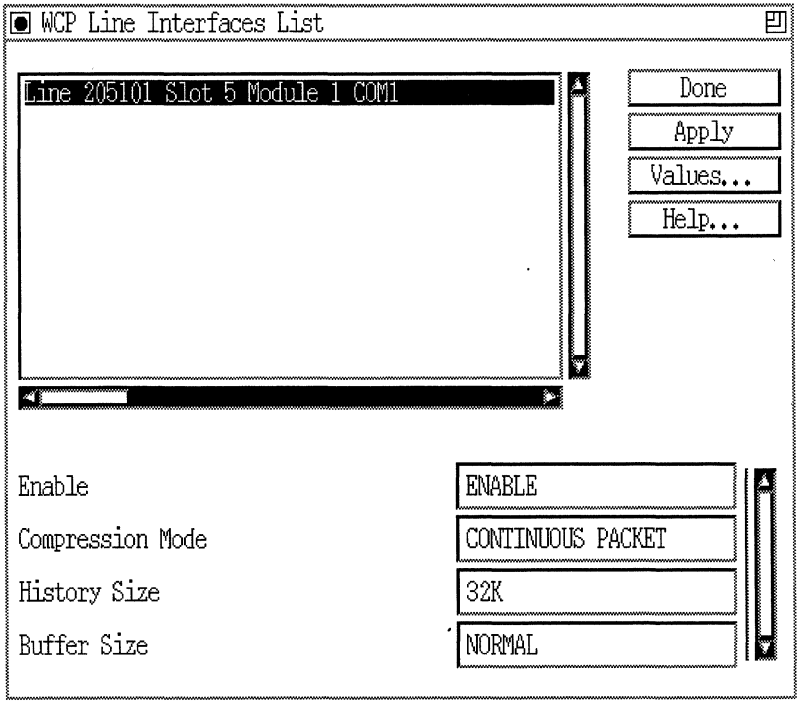


Figure 3-3. WCP Line Interfaces List

2. Select a line from the list in the top left corner of the window. The values in the parameter fields apply to the WCP line interface you highlight.
3. Edit those parameters you want to change, using the descriptions following this procedure as a guide.

4. Click on the Apply button to implement your changes.
5. Repeat steps 2 - 4 for each parameter you want to edit.
6. Click on the Done button to exit the window.

WCP Line Parameter Descriptions

Use the following descriptions as guidelines when you configure the WCP line parameters.

Parameter:	**Enable**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables data compression on the line.
Instructions:	WCP automatically sets this parameter to Enable when you select WCP in the Select Protocols window. If you want to temporarily disable WCP rather than delete it from the router, set this parameter to Disable. Reset it to Enable to re-enable WCP.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.1.1.2

Parameter:	**Compression Mode**
Default:	Continuous Packet
Options:	Continuous Packet | Packet by Packet
Function:	Indicates the compression mode on the line. Continuous Packet Compression (CPC) retains compression history across packets, and allows a higher compression ratio than does Packet-by-Packet Compression (PPC). PPC resets compression history at the start of each packet, and results in a lower compression ratio. Since PPC does not depend on previous packets, you should select this option for a link that drops a large number of packets.
Instructions:	Select either Continuous Packet or Packet by Packet.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.1.1.5

Parameter:	**History Size**
Default:	32 K
Options:	32 K | 8 K
Function:	Indicates the history size for the compression facility for the line. Accept the default of 32 K to maximize compression unless allocating this amount of memory to compression overtaxes your system. Remember that history size includes separate compression and decompression histories and lookup tables on each side of a link. Selecting 32 K for PPP WCP should not pose a problem because PPP allows only one circuit per line.
Instructions:	Select either 32 K or 8 K.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.1.1.6

Parameter:	**Buffer Size**
Default:	Normal
Options:	Very Large | Large | Normal | None
Function:	Indicates the amount of buffer memory for the decompressor on a line. Set Buffer Size according to the end-to-end round-trip length of a WCP connection.
Instructions:	Select Normal for most land-line coast-to-coast connections. Select Large or Very Large for connections at a great distance from each other, such as satellite. Select None for links that drop a very small number of packets. Increase the buffer size for a link with a large number of resets.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.1.1.7

Editing WCP Interface Parameters

To edit WCP interface parameters, begin at the Configuration Manager window (refer to Figure 3-2) and proceed as follows:

1. Select Protocols→WCP→Interfaces.

The WCP Circuit Interfaces List window appears (Figure 3-4).

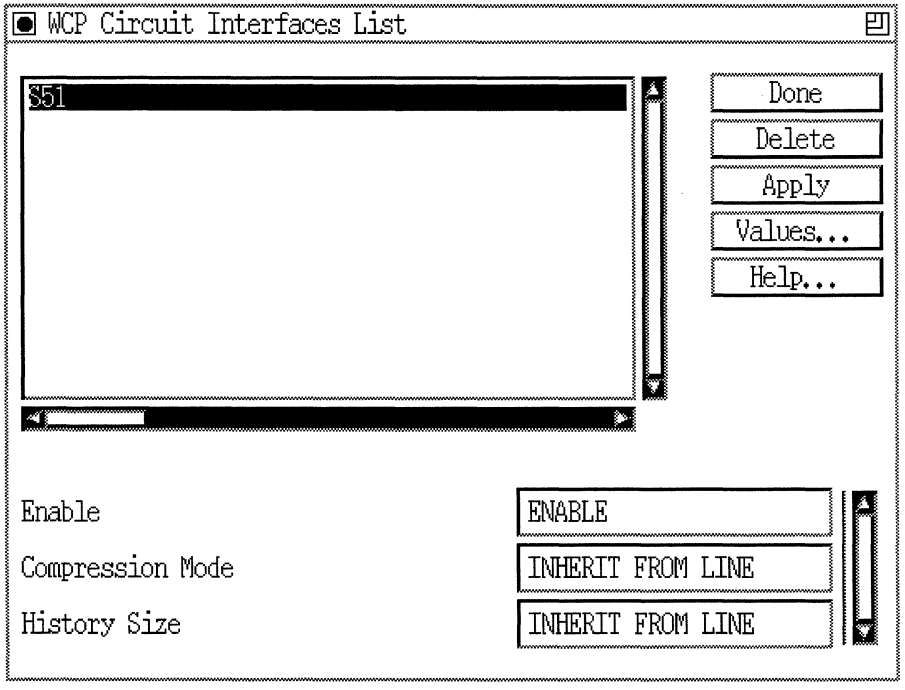


Figure 3-4. WCP Circuit Interfaces List

2. Select the WCP circuit that you want to edit from the list in the top left corner of the window. The values in the parameter fields apply to the WCP circuit interface you highlight.
3. Edit those parameters you want to change, using the descriptions following this procedure as a guide.

4. Click on the Apply button to implement your changes.
5. Repeat steps 2 - 4 for each parameter you want to edit.
6. Click on the Done button to exit the window.

WCP Interface Parameter Descriptions

Use the following descriptions as guidelines when you configure the WCP interface parameters.

Parameter:	**Enable**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables data compression on a circuit.
Instructions:	WCP automatically sets this parameter to Enable when you select WCP in the Select Protocols Window. If you want to temporarily disable WCP rather than delete it from the router, set this parameter to Disable. Reset it to Enable to re-enable WCP.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.2.1.2

Parameter:	**Compression Mode**
Default:	Inherit from Line
Options:	Continuous Packet | Packet by Packet | Inherit from Line
Function:	Indicates Compression Mode for a circuit. Continuous Packet Compression (CPC) retains compression history across packets, and allows a higher compression ratio than does Packet-by-Packet Compression (PPC). PPC resets compression history at the start of each packet, and results in a lower compression ratio. Since PPC does not depend on previous packets, you should select this option for a link that drops a large number of packets. Inherit from Line allows you to set WCP parameters at the line level and apply them to circuits. For PPP, with only one circuit per line, this means that you can configure WCP at either the circuit level or the line level.
Instructions:	Select Inherit from Line if you want to accept the value in effect for the WCP Compression Mode line parameter. Otherwise, select either Continuous Packet or Packet by Packet.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.2.1.4

Parameter:	**History Size**
Default:	Inherit from Line
Options:	Inherit from Line | 32 K | 8 K
Function:	Indicates the history size for the compression facility for a circuit. Select 32 K to optimize the compression ratio unless allocating this amount of memory to compression overtaxes your system. Remember that history size entails separate compression and decompression histories and lookup tables on each side of a link in the amount of memory you select. Selecting 32 K for PPP WCP should not pose a problem because PPP allows only one circuit per line.
Instructions:	Select Inherit from Line if you want to accept the value in effect for the WCP History Size line parameter. Otherwise, select either 32 K or 8 K.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.2.1.5

Deleting Data Compression from a Router

To delete WCP from *all* circuits on which it is currently configured, complete the following steps:

1. From the Configuration Manager window (Figure 3-2), select Protocols→WCP→Delete WCP. A window pops up and prompts `Do you REALLY want to delete WCP?`
2. Click on the OK button.

Site Manager returns you to the Configuration Manager window. WCP is no longer operating on the router.

Index

B

buffer
  history, 1-2
Buffer Size parameter, 3-7

C

CCP
  definition, 1-2
  initialization, 1-3
  negotiations, 1-4
compression
  architecture, 1-1
  deleting from a router, 3-12
  enabling, 1-2, 3-2
  features, 2-1
  implementation, 2-1 to 2-2
  overview, 1-1 to 1-6
Compression Control Protocol
  definition, 1-2
  initialization, 1-3
  negotiations, 1-4
compression mode, 1-4
Compression Mode parameter, 3-6, 3-10

D

data compression
  architecture, 1-1
  deleting from a router, 3-12
  enabling, 1-2, 3-2
  features, 2-1
  implementation, 2-1 to 2-2
  overview, 1-1 to 1-6
deleting compression, 3-12
dial backup, 2-2
dial-on-demand, 2-2

E

editing parameters, 3-1 to 3-12
Enable parameter, 3-5, 3-9
enabling compression, 1-2, 3-2

H

header compression, 2-1
History Size parameter, 3-6, 3-11

I

implementation notes, 2-1 to 2-2
interface parameters, 3-8 to 3-11

L

Lempel-Ziv, 1-2
line parameters, 3-5 to 3-7
LZ-77 algorithm, 1-2

N

NCP
  negotiations, 1-3
Network Control Protocol
  negotiations, 1-3

P

parameters
  editing, 3-1 to 3-12
  interface, 3-8 to 3-11
    Compression Mode, 3-10
    Enable, 3-9
    History Size, 3-11
  line, 3-5 to 3-7
    Buffer Size, 3-7
    Compression Mode, 3-6
    Enable, 3-5
    History Size, 3-6

S

Select Protocols window
  enabling compression, 3-2

W

WCP
  definition, 1-2
  deleting from a router, 3-12
  enabling, 1-2
  features, 2-1
  implementation, 2-1 to 2-2
  initialization, 1-3
  negotiations, 1-4
  overview, 1-1 to 1-6
Wellfleet Compression Protocol
  definition, 1-2
  enabling, 1-2
  negotiations, 1-4