HiPer DSP T1 and E1

Network Application Card
Product Reference

Part No. 1.024.1873-00
Version Number 2.0

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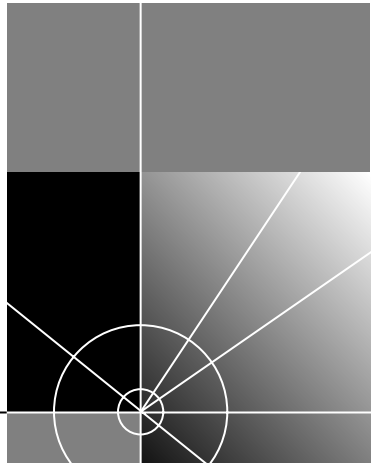

http://www.3com.com/

Part No. 1.024.1873-00

3Com Corporation
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Year 2000 Compliance

For information on Year 2000 compliance and 3Com products, visit the 3Com Year 2000 web page:

http://www.3Com.com/products/yr2000.html

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About This Reference

About This Reference is an overview of the Hiper DSP Product Reference conventions. Also, in this overview you will find where to look for specific information, including 3Com contact information.

This reference contains information about:

- Various card features
- Standard configuration profiles
- Configuration utilities
- AT commands
- Span line commands
- Display, help, and query screens

Finding Specific Information in This Reference

This table shows the location of specific information in this guide.

To configure	Go to chapter
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Document Conventions

The tables below list conventions used throughout this reference.

Notice Icons

Icon	Notice Type	Description
	Information note	Information containing important features or instructions.
	Caution	Information to alert you to potential damage to a program, system, or device.
	Warning	Information to alert you to potential personal injury or fatality. May also alert you to potential electrical hazard.
	ESD	Information to alert you to take proper grounding precautions before handling a product.

Text Conventions

Convention	Description
`Syntax`	The word "syntax" means you must evaluate the syntax provided and supply the appropriate values. Placeholders for values you must supply appear in angle brackets. Example: Enable RIPIP by using the following syntax: `SETDefault !<port> -RIPIP CONTrol = Listen` In this example, you must supply a port number for <port>. Also note that some unknown variables may be marked as "`x`" (e.g. `chdev tslot x`).
`Commands`	The word "command" means you must enter the command exactly as shown in text and press the Return or Enter key. Example: To remove the IP address, enter the following command: **`SETDefault !0 -IP NETaddr = 0.0.0.0`** *This guide always gives the full form of a command in uppercase and lowercase letters. However, you can abbreviate commands by entering only the uppercase letters and the appropriate value. Commands are not case-sensitive.*
`Screen displays`	This typeface represents information as it appears on the screen.

Convention	Description
[Key] names	Key names appear in text in one of two ways: ■ Referred to by their labels, such as "the Return key" or "the Escape key" ■ Written with brackets, such as [Return] or [Esc]. If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example: Press [Ctrl]+[Alt]+[Del].
Menu commands and *buttons*	Menu commands or button names appear in italics. Example: From the *Help* menu, select *Contents*.
Words in *italicized* type	Italics emphasize a point or denote new terms at the place where they are defined in the text.
Words in **bold-face** type	Bold text denotes key features.

Technical Conventions

The following are the technical conventions of this document:

Common terms	Documentation uses this terms
HiPer DSP	HiPer DSP, HDM (HiPer DSP Modem)
General discussion of T1/PRI (ISDN over T1 spans) or E1/PRI (ISDN over E1 spans)	PRI
T1 (ISDN over T1 spans)	T1/PRI
E1 (ISDN over E1 spans)	E1/PRI
E1/R2 (R2 over E1 spans)	E1/R2
Channelized T1	CHT1

Contacting 3Com

Before Contacting 3Com Technical Support

Before contacting 3Com, have the following information available:

- Description of the problem
- List of the products you are using
- List of all the software and hardware versions, and serial numbers
- List of the symptoms
- Any known causes
- The fixes you have tried
- Your contract number

Phone Numbers

Call the appropriate toll free number listed below for technical support.

For European countries that do not have a toll free number listed, call +31 30 602 9900.

Country	Toll Free Number	Country	Toll Free Number
Austria	06 607468	**Netherlands**	0800 0227788
Belgium	0800 71429	**Norway**	800 11376
Canada	1800 2318770	**Poland**	00800 3111206
Denmark	800 17309	**Portugal**	0800 831416
Finland	0800 113153	**South Africa**	0800 995014
France	0800 917959	**Spain**	900 983125
Germany	0800 1821502	**Sweden**	020 795482
Hungary	00800 12813	**Switzerland**	0800 553072
Ireland	1800 553117	**UK**	0800 966197
Israel	0800 9453794	**United States**	1800 2318770
Italy	1678 79489	***All Other Locations*** ***(Outside Europe)***	1847 7976600

Refer to the Total Control Hub Documentation CD-ROM for more information regarding product warranty.

For information about Customer Service, including support, training, contracts, and documentation, visit our website at ***http://totalservice.3com.com***

1 OVERVIEW

This chapter contains:

- HiPer DSP package contents
- What is in this reference
- Total Control Enterprise Network Hub overview
- HiPer DSP Network Interface Card and Network Application Card overview

Package Contents

Because 3Com sells HiPer DSP in over 20 different packages, this is a general description of package contents.

Hardware

- HiPer DSP Network Application Card (NAC)
- HiPer DSP Network Interface Card (NIC)

Cables

- Console cable
- Null modem adapter

Documentation

- 3Com Total Control CD-ROM containing:
  - HiPer DSP Product Reference
  - Documentation supporting all Total Control Hub products
  - 3Com Warranty
- HiPer DSP NIC Installation Guide
- HiPer DSP NAC Installation Guide

What is in This Reference

Use this HiPer DSP Product Reference to find detailed information about the following:

- HiPer DSP overview
- HiPer DSP Network Application Card (NAC)
- HiPer DSP T1/E1 Network Interface Card (NIC)
- HiPer DSP Features
- Package contents

HiPer DSP Applications

HiPer DSP provides the following functionality when integrated with the Total Control Enterprise Network Hub.

For service providers, the product allows dial-in and dial-out Internet access, managed remote access, transaction processing capabilities, and the flexibility to be used in analog, Frame Relay, Ethernet, Token Ring and ISDN environments.

For universities, financial institutions, health care companies and other corporations, HiPer DSP allows remote users to access e-mail, the Internet, databases and additional corporate resources.

HiPer DSP Overview

The HiPer Access System delivers the highest port count currently available in the smallest amount of space -- 336 ports (or 420 ports for E1 users) in less than 22.86 cm / 9 inches of rackmount height.

Digital Signal Processor

In a fully loaded 336 port configuration connected to T1 lines, Total Control delivers more than 17,000 MIPS (Millions of Instructions Per Second) of processing power.

DSP Call Processing

HiPer DSP enables a single DSP engine to process two remote user calls.

Flexibility

HiPer DSP has the flexibility to terminate analog modem and ISDN calls in the same DSP engine.

Upgradability

HiPer DSP is a software-based platform. This platform is upgradeable when 3Com develops new technologies and features.

System Capabilities

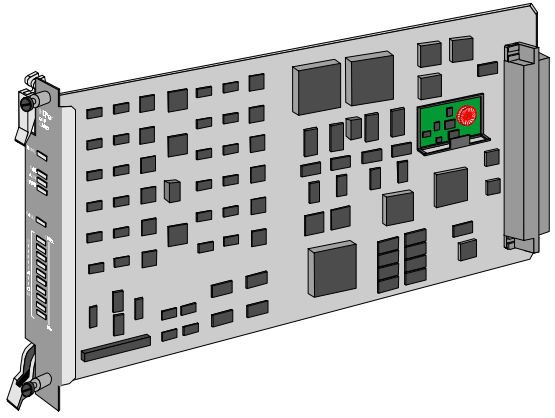
Protocols

HiPer DSP supports different protocols based on line type:

Configuration	Calls supported	Supports
Channelized T1	24	V.34, x2/V.90*
T1 PRI	23	V.34, x2/V.90*, x.75, V.110, and V.120
Channelized E1	30	V.34, x2/V.90*, x.75, V.110, and V.120
E1 PRI	30	V.34, x2/V.90*x.75, V.110, and V.120

* x2 and V.90 protocols require a "trunk side", rather than "line side", T1/E1 circuit. Trunk side circuits introduce no additional digital or analog conversions in the call path; line side circuits do, making x2 and V.90 connections impossible.

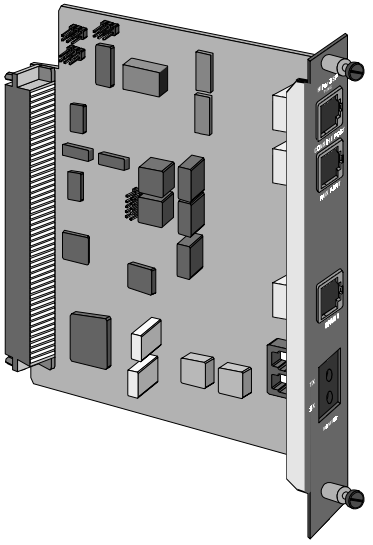
HiPer DSP Network Application Card



HiPer DSP Network Application Card (NAC) provides 24 (or 30 for E1/PRI users) dial-up modems on a single NAC. Each modem on the NAC supports many digital protocols, such as V.110, V.120, X.75, server x2, and V.90 modulation.

HiPer DSP modems contain a common microprocessor-based circuit providing interfaces to the chassis midplane. The modems input and output digital signals to HiPer DSP Network Interface Card (NIC).

HiPer DSP Network Interface Card, Second Revision



The HiPer DSP Network Interface Card (NIC), second revision, terminates one CHT1, T1/PRI, E1/R2, or E1/PRI span. It must be used in conjunction with a HiPer DSP Network Application Card (NAC).

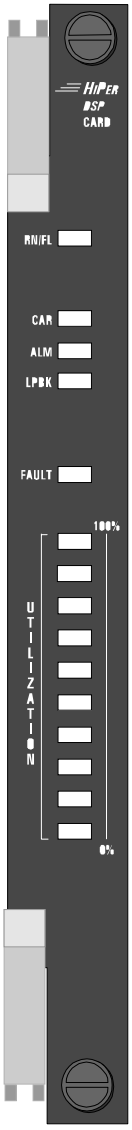
The HiPer DSP NIC, second revision, part number 80-001826-02, is available with TCS 3.5. This new HiPer DSP NIC enables users to select the span mode (T1 or E1) and also to select what is sent to the line when the NAC is unplugged and power is on or the NIC is held in reset. All other functionality remains the same.

Only HiPer DSP software version 2.0.10.4 and later support NIC II. For more information about receiving new TCS software, visit our website at ***http://totalservice.3com.com***

For more information about configuring HiPer DSP NIC, refer to the following chapter, *HiPer DSP Features and Configuration.*

HiPer DSP Network Application Card Faceplate Including Light Emitting Diodes

Below left is the HiPer DSP NAC faceplate, and below is a table of the NAC LED descriptions. HiPer DSP card has several diagnostic Light Emitting Diodes (LEDs). For a detailed explanation of the LEDs and how to troubleshoot them, see the Appendix, Troubleshooting the Span.



Faceplate

LED	Color	This has occurred
RN/FL	green	Card has completed the Power On Self Test (POST)
	flashing green	Diagnostics running
	red	Card failed
	flashing orange	Flash programming
CAR	off	Card has received no signal or poor signal
	green	Card has received good carrier
	red	Card has received bad carrier
	yellow	Card has received remote alarm
ALM	off	No alarm or remote frame alarm (RFA)
	red	Alarm present
LPBK	off	Span is CHT1, or E1/R2, or NFAS with no D-channel
	green	Green: D-channel is up (PRI mode) Flashing green: Backup D-channel is up (NFAS)
	red	D-channel is down (PRI mode)
	yellow	Loopback test in progress (all modes)
FAULT	green	All modems are functioning
	yellow	There is a problem in one or more modems
	red	There is a critical problem in one or more modems
UTILIZATION	off	Modems are not in use
	green	Modems in use. The ten utilization LEDs indicate the percentage of modems on HiPer DSP in use.

2 HiPer DSP Features and Configuration

This chapter contains:

- Card features
- Configuration utilities
- Configuring HiPer DSP Network Interface Card

For setup and installation of HiPer DSP Network Application Card (NAC) and the T1/E1 Network Interface Card (NIC) and LEDs, see the HiPer DSP Getting Started Guides.

New in This Release

This release implements these new features:

- Support for Bell 103 and V.23 modem standards
- NFAS D-channel backup
- E1/R2 signaling
- Support for additional gateway cards
- Adjustable transmit level options

Below is a general description of each new feature.

V.23 and Bell 103 Modem Standards

V.23 is an ITU standard (1964) for asynchronous and synchronous 0–600 and 0–1200 bps half-duplex modems that use dial-up lines. It has an optional split-speed transmission method with a reverse channel of 0–75 bps (1200/75, 75/1200). V.23 uses Frequency Shift Keying (FSK) modulation.

Bell 103 is an AT&T standard for asynchronous 300 bps full-duplex modems using FSK modulation on dial-up lines.

Non-Facility Associated signaling with D-Channel Backup

Non-Facility Associated Signaling (NFAS) is a special case of ISDN signaling in which two or more T1 PRI lines use the same D-channel, and users can add a backup D-channel. NFAS is required for Switched-1536 data service; because all 24 channels of the T1 PRI line carry user data, the D-channel must be on another line.

To increase the level of services in the Total Control Hub when using PRI, the HiPer DSP implements NFAS with D-channel backup capability.

NFAS also provides cost savings over standard ISDN by minimizing the number of D-channels that need to be routed while keeping the out-of-band-signaling advantage ISDN offers.

E1/R2 Signaling

HiPer DSP employs R2 line signaling to achieve basic call setup and teardowns. Line signaling performs no transmission of numbers or other call details. HiPer DSP also employs Multi-Frequency Compelled (MFC) register signaling to transmit the called and calling numbers and other information between exchanges using in-band multi-frequency signaling.

Gateway Card Support

The HiPer DSP 2.0 supports the following gateway cards:

- 486 NETServer
- HiPer ARC
- EdgeServer
- EdgeServer Pro
- X.25

NFAS support requires no changes at the gateway.

Adjustable Transmit Level

Adjustable transmit level provides optimal perfomance for most analog sources. Ranges: -0 to -20 dBm for analog line sources and -3 to -30 dBm for digital T1 line sources. A setting of -13 dBm (S39=13) is recommended for calls over digital lines (T1 or PRI).

HiPer DSP Features

The following is a description of each feature.

Extended Telephony Supplementary Services Group

HiPer DSP, in conjunction with a Siemens switch and special clientside software, supports the Extended Telephony Supplementary Services Group (ETSSG): call waiting and email waiting on Internet busy.

European Dialing Plan

HiPer DSP handles phone numbers containing up to 36 digits. This capability provides support well beyond the known requirements for any country planning to extend dial capability.

Span Signaling Protocol

HiPer DSP supports the following span signaling protocol: TS038 (Australia)

No additional network management is required.

Gateway Card Support

Refer to the New Features section at the beginning of this chapter.

V.42 *bis* and Microcom Networking Protocol 5 Data Compression

Data compression enables potential throughput of up to 115.2 kbps on analog 33.6 kbps connections. HiPer DSP modems connecting under V.42 error control use V.42 *bis* compression.

Dialed Number Identification Service and Automated Number Identification Support

HiPer DSP can interpret and display Dialed Number Identification Service (DNIS) and Automatic Number Identification (ANI) information.

V.42 and Microcom Networking Protocol Error Control

Data integrity is ensured when HiPer DSP connects with remote devices that use the V.42 Link Access Protocol for Modems or Microcom Networking Protocol (MNP) error control protocols. Error control is available on analog calls at 1200 bps and above.

Flash ROM Upgradability

HiPer DSP modems are software-upgradable using Total Control Manager or ZMODEM file transfers, allowing access to updates of HiPer DSP technology.

Link Diagnostics

After and during each call, you can display a Link Diagnostics screen containing information about the last call. This information includes the number of data characters transferred, line statistics, the call's rate, and the reason the call failed.

Telnet Call Progress and Connect Messages

When dialing from a Telnet terminal connection (ATDT <command>), the modem returns call progress and connect messages, such as *Ringing*, *Busy*, I*No Answer*, and *Connect*.

Selective Reject

This feature works under V.42 error control and offers significant throughput improvements over noisy lines. Selective reject reduces the number of retransmitted blocks due to block errors (blers).

Transmitter Level Adjustment

This feature the modem's transmitter decibel level.

Software Download

Software download is supported via the management channel and via the Console Port. The software is stored in Flash non-volatile memory (NVRAM). HiPer DSP maintains full operation during the software download.

T1 Idle/Disconnect Pattern Value

This value should only be changed by qualified T1 professionals.

V.90 Protocol

HiPer DSP supports the ITU V.90 protocol. The V.90 protocol supports asymmetric speeds of 56 kbps downstream (data flow from HiPer DSP and other server V.90 modems) and 33.6 kbps upstream (data flow from client V.90 modems). Currently, the Federal Communications Commission (FCC) limits downstream speeds to 53 kbps.

x2 Protocol

3Com's x2 protocol supports asymmetric speeds of 56 kbps downstream (data flow from HiPer DSP and other server x2 modems) and 33.6 kbps upstream (data flow from client x2 modems). Currently, the FCC limits downstream speeds to 53 kbps.

HiPer DSP ISDN Features

Below is a description of each feature.

Asynchronous and Synchronous Point to Point Protocol Support

HiPer DSP supports synchronous Point to Point Protocol (PPP) and asynchronous PPP connections.

Central Office Switch Compatibility

HiPer DSP supported switches include:

- AT&T 4ESS (U.S)
- AT&T 5ESS (U.S)
- National ISDN-1 (U.S)
- NT DMS-100/250 Custom
- Northern Telecom DMS-100
- NET5/CTR-4 (European ISDN)
- VN4 (France)
- NI-2 (Japan)
- INS1500 (Japan)
- TS014 (Australia)
- Switches using National ISDN-1 or National ISDN-2 call control signaling (ITU-T Q.931/I.451 call control signaling).

In-Band Monitoring

Because the possibility always exists that the telephone company's equipment can incorrectly label calls, HiPer DSP monitors and compares the call set-up messages and the line activity.

Non-Facility Associated Signaling with D-Channel Backup

Refer to the New Features section at the beginning of this chapter.

Rate Adaptation

HiPer DSP's support of the X.75, V.120, and V.110 protocols allows it to map slower-speed asynchronous data to the 64-kbps B-channel. The HiPer DSP's rate adaptation capability spans the range of 300 bps to 64 kbps.

V.120, V.110, and X.75 are standards for passing asynchronous data over ISDN B-channels, which are inherently synchronous. To make a connection using V.120, V.110, or X.75, the device at the other end of the connection must also support V.120, V.110, or X.75.

Universal Connect

The Universal Connect feature automatically connects the HiPer DSP to an ISDN device or analog modem without having to specify the type of connection.

When you set HiPer DSP to answer calls with Universal Connect (the default), it autosenses V.120, V.110, analog modem or asynchronous to synchronous PPP connections.

Synchronized Defaults

HiPer DSP and the Network Management Card synchronize defaults when users reset the HiPer DSP defaults using Total Control Manager.

HiPer DSP Configuration Utilities

3Com recommends using Total Control Manager to configure, save, and monitor most settings of the Total Control modem cards, HiPer DSP and Quad Modem. Use the console interface when directed.

You can use software to configure HiPer DSP in several ways:

If you want to configure	Compatible Management Stations	Use
Modems using MIBs	Windows 3.1, Windows 95,	Total Control Manager
Span lines using MIBs	Windows NT, or UNIX	TCM/SNMP and a MIB browser
Modems using a command line	Any operating system	Console Interface in conjunction with your preferred terminal program (for example HyperTerminal)
Span lines using a command line interface		Console Interface in conjunction with your preferred terminal program

All instructions in this guide, for configuring HiPer DSP, are console interface configuration instructions—unless specified otherwise. For detailed Total Control Manager configuration instructions, see the Total Control Manager Product Reference.

Management Information Base Objects and Enumerated Values

For detailed information about MIB objects and enumerated values, refer to the Parameter Reference Guide. Also see page 16-10 of this reference, How HiPer DSP with V.90 Interacts with Total Control Manager and the Network Management Card.

Configuring HiPer DSP Network Interface Card, Second Revision

The HiPer DSP NIC, second revision, includes two new jumpers, which enable users to select the span mode (T1 or E1) and also to select what is sent to the line when the NAC is unplugged and power is on or the NIC is held in reset.

When unplugged or reset, the original version of the HiPer DSP NIC automatically went into loopback, which at times adversely affected service to spans over the Public Switched Telephone Network.

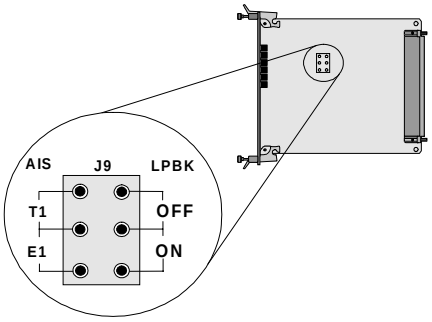
The two jumpers are:

- Span Mode During Reset State
- Power On Relay Loopback State

The jumper settings only apply when NAC is unplugged and power is on or the NIC is held in reset. The jumpers have no effect during normal operation.

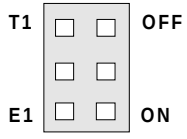
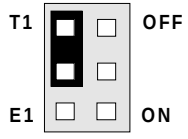
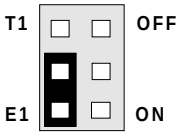
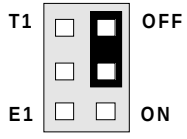
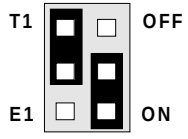
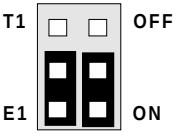
For more information, refer to the following page, which includes a table and figures of the configurations.

Use the following tables and figures to configure the jumpers.



DIP Switch	Function
T1/E1	Transmitting all Zeros.
T1	Transmitting all Ones (AIS) in T1 Mode. *This is the T1 package factory setting*
E1	Transmitting all Ones (AIS) in E1 Mode. *This is the E1 package factory setting*
OFF	Power ON Relay Loopback Disabled. *This is the standard factory setting*
ON	Power ON Relay Loopback Enabled

The following table includes figures of the jumper settings.

T1/E1 	**T1** 	**E1** 
LPBK OFF 	**T1 LPBK ON** 	**E1 LPBK ON** 

If the loopback jumper is not in place, loopback is off.

To use loopback, you must select a span mode: T1 or E1. If you do not select T1 or E1, the NIC will default to the high impedance (all zeroes) state even if the loopback jumper is ON.

When the power is off, the NIC is in high impedance mode, which is different from the original NIC because it executed loopback mode.

If you unplug and reset the NIC, be sure to unplug and reset the HiPer DSP NAC after resetting the NIC.

For more information about HiPer DSP NIC, second revision, refer to the HiPer DSP T1/E1 Getting Started Guide.

3 CONSOLE INTERFACE BASICS

This chapter contains:

- Displaying context-sensitive help
- Sending span-line commands to the span
- Sending AT commands to the modems

For detailed AT and span line information, see Chapter 7, Using AT Commands, and Chapter 18, Configuring NFAS with D-Channel Backup.

Overview

Use the Console Interface to:

- Configure the entire span line
- Configure individual timeslots
- Configure individual modems
- Display modem status
- Display span status

Total Control Manager and Management Information Base Users

When using Total Control Manager or MIB management software, you do not need to configure HiPer DSP with the Console Interface. 3Com recommends using Total Control Manager for most functions. See the Total Control Manager Product Reference for more information.

Before You Begin

Before accessing the Console Interface:

Step 1

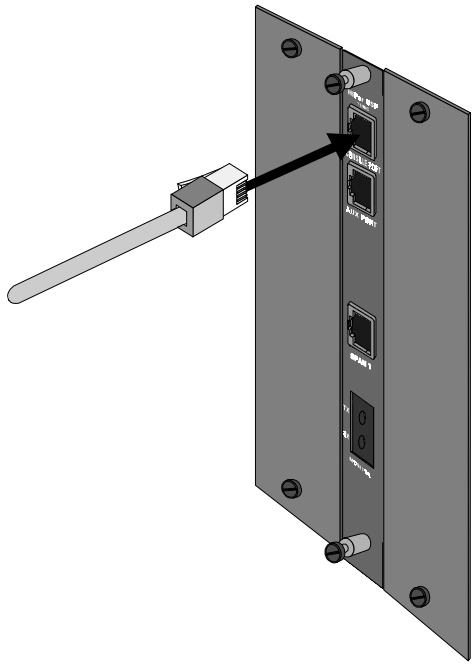
Request lines from your telephone company.

For more information about contacting your telephone company, setting up your lines, and configuring them, see Chapter 4, Configuring Channelized T1 or Chapter 5, Configuring PRI.

Step 2

Connect HiPer DSP console port on the Network Interface Card (NIC.

Connect to HiPer DSP NIC attaching a standard RJ-45 connector to the Console Port as shown below.



Step 3

Access the Console Interface with terminal software.

Use a communications program to select terminal software. Select 8 bits, no parity, no flow control, and 9600 bps.

After configuring HiPer DSP's Console port, establish a connection from your personal computer or management workstation.

The Console Interface displays the following prompt when powered up:

```
!!------------------‡ SDL/2 for the PPC403
?-----------------!!
__Enter Download Trigger__
Flash Image Has Valid CRC, Loading Image
```

After the HiPer DSP boots, the Console Interface displays the following password screen.

```
HiPer DSP console password:
```

By default, you do not have to enter a password. After pressing *Enter*, the Console Interface displays the following root prompt.

```
>
```

You are now ready to use the Console Interface to configure HiPer DSP.

Understanding Basic Console Interface Commands

The Console Interface is structured to allow you easy access to the following aspects of HiPer DSP:

- Command level
- Root level
- Modem level
- Span level
- Span card level
- Timeslot level

Once you understand how to navigate through these levels, for detailed AT and span line information, see Chapter 7, Using AT Commands, Chapter 19, Console Interface Span Commands, and Appendix H, Span Line display commands.

Understanding Console Interface Command Levels

The Console Interface has several command levels, each controlling a specific aspect of HiPer DSP. Listed below is a Console Interface command tree. This command tree shows all levels of the Console Interface.

To configure	Switch to	Command
Modems	mdmx>	chdev mdm x
Span card	spncard>	chdev spncard
Span	span1>	chdev span
Timeslots	span1/tslotx>	chdev tslot x

Root-Level Commands

Root-level (>) commands include

Commands	Function
chdev <root | mdm | spncard | span | tslot>	Change device/command prompt level
date	Display system time/date
help	List valid commands
passwd	Change password
reboot	Reboot card
rmt	Set/Display remote console settings
quit	Quit console interface
uptime	Show system uptime
version	Show version

:Span-Level Commands

Span-level (span>) commands include:

Commands	Function
chdev <root | mdm | spncard | span | tslot>	Change device/command prompt level
clear	Clear parameter
cmd	Execute a command
date	Display system time/date
display	Display parameters
help	List valid commands
quit	Quit console interface
reboot	Reboot card
rmt	Set/Display remote console settings

Commands	Function
set	Set parameter
uptime	Show system uptime
version	Show version

Span Card-Level Commands

Span card-level (spncard>) commands include::

Commands	Function
chdev <root | mdm | spncard | span | tslot>	Change device/command prompt level
clear	Clear parameter
cmd	Execute a command
date	Display system time/date
display	Display parameters
help	List valid commands
quit	Quit console interface
reboot	Reboot card
rmt	Set/Display remote console settings
set	Set parameter
uptime	Show system uptime
version	Show version

Timeslot-Level Commands

Span timeslot-level (span1\tslot1>) commands include::

Commands	Function
chdev <root | mdm | spncard | span | tslot>	Change device/command prompt level
chtslot	Change span line timselot
clear	Clear parameter
cmd	Execute a command
date	Display system time/date
display	Display parameters
help	List valid commands
quit	Quit console interface
reboot	Reboot card
rmt	Set/Display remote console settings

Commands	Function
set	Set parameter
uptime	Show system uptime
version	Show version

Modem-Level Commands

Modem-level (mdmx>) commands include::

Commands	Function
at	Enter AT command string
chdev <root | mdm | spncard | span | tslot>	Change device/command prompt level
chmdm	Change modem channel
date	Display system time/date
help	List valid commands
quit	Quit console interface
reboot	Reboot card
rmt	Set/Display remote console settings
uptime	Show system uptime
version	Show version

Abbreviating Console Interface Commands

You can use the console interface to abbreviate commands, provided you enter enough of the command to make it unique.

If the abbreviated command is not complete enough, help information displays.

Using Root Commands

Root-level commands help diagnose HiPer DSP. The root-level command is initially displayed each time you establish a connection to the Console Interface.

See below for a detailed explanation of each command.

To do this	Command
Display how long the card has been running (hours:minutes:seconds). When you reboot HiPer DSP, the time resets to zero.	uptime
Display HiPer DSP version number and date.	version
Quit Console Interface.	quit

To do this	Command
Reboot HiPer DSP. When the HiPer DSP reboots, the Console Interface asks for confirmation.	reboot
Set the Console Interface password.	passwd
Switch between devices.	chdev
View help.	help

Viewing Help Commands

The Help command displays Console Interface commands and span-line command parameters, for each HiPer DSP command level.

This help	Provides
General	A list of commands that can be entered from a particular command level.
Positional	Information pertaining to a specific command. To obtain positional help, enter the command with no parameters, or enter help <command name>. The Console Interface then displays a list of all command parameters.

When using a modem, you can display HiPer DSP AT command help using the AT$ commands. See Chapter 7, Using AT Commands, or Chapter E, AT Commands at a glance, for more information about AT commands.

Using Help

Use the following commands to obtain HiPer DSP help:

To obtain	Command	Example
General help	help	help
Specific help	help <command name>, or <command name>	help chdev, or chdev (by itself)

When you use HiPer DSP console interface to display help for MIB objects, the MIB object name that appears corresponds to each command. These MIB names are in brackets at the end of each command line (for example [MIB name]).

Automatic Pauses

The Console Interface automatically pauses scrolling when displaying more than 20 lines of information by placing the "- - MORE - -" prompt at the bottom-left of each screen.

To continue scrolling through the information, press *Enter*.

To stop scrolling and issue commands from that point, press *Q*, then press *Enter*.

Switching Between Devices

Use the change device (chdev) command to access specific devices, such as modems or the span, or change to a specific command level prompt. You can issue the chdev command from any command level.

To change to the	Command
Root command prompt	chdev root
Modem command prompt	chdev mdm
Span card command prompt	chdev spncard
Span line command prompt	chdev span
Timeslot command prompt	chdev tslot

Switching Between Modem Channels and Span Timeslots

The chdev mdm and chdev tslot commands can have a third parameter, which specifies a specific modem channel or timeslot.

This command	Where x is the specific
chdev mdm <x>	Channel
chdev tslot <x>	Timeslot

If no specific modem channel or timeslot is specified, the Console Interface returns you to the previously used modem or timeslot.

If you change to a modem or timeslot for the first time without entering a specified channel or timeslot, the Console Interface displays the first channel or timeslot.

Quitting the Console Interface

The quit command exits the console interface and ends the connection. You can enter the quit command from any command level prompt.

Using Modem Commands

Use the modem commands to navigate through all the modem channels, and to configure specific channels, or groups of channels, for certain uses.

Switching to Modems

Use the following table to switch to other modems within the HiPer DSP.

To change to	Command	Example
A specific modem (when you're switching from another non-modem)	chdev mdm <x>	chdev mdm 3
A specific modem	chmdm <x>	chmdm 3

The Change Modem (chmdm) command moves you to a specified modem channel. You can switch to 1-24 (for T1-PRI and CHT1 devices) or 1-32 (for E1-R2 and E1-PRI devices).

Sending AT Commands

When you are at the "MDM" prompt, you can enter AT commands. See Chapter 6, Using AT Commands and Appendix D, AT Commands at a glance, for more information about AT commands.

```
>chdev mdm 7
mdm7>at
OK
```

Saving the Modem Configuration

Save the modem configuration by moving to the modem level and entering the following command.

```
mdmx>at&w
```

Using Span Line Commands

Use the span line commands to navigate through all timeslots and configure individual timeslots for certain uses.

Switching to Timeslots

Use the following table.

To change to	Command	Example
A specific timeslot	chdev tslot <x>	chdev tslot 3

*The **Change Timeslot (chdev tslot)** command moves you to a specified timeslot. You can switch to 1-24 (for T1-PRI and CHT1 devices) or 0-31 (for E1-R2 and E1-PRI devices). For E1, Timeslot 0 is the framing channel, timeslot 16 is the signalling channel, and timeslots 1-15 and 17-31 are the traffic channels.*

Sending Span Line Commands

From the span prompt, you can enter span-line commands. See Chapter 17, Console Interface Span Commands and Appendix H, Span Line Display Commands, later in this reference for more information about span-line commands.

```
>chdev SPAN
SPAN1>
```

Saving the Span Line Configuration

Save the span configuration by moving to the span level and entering the following command.

```
span1>cmd svspcfg
```

If you have changed the signaling mode of HiPer DSP, reboot HiPer DSP for this change to take effect.

4 CONFIGURING CHANNELIZED T1

Use this chapter to configure HiPer DSP for use with T1 lines after you have installed HiPer DSP into a Total Control Hub.

If your site is using T1/PRI lines or E1/PRI lines, see Chapter 5, Configuring Primary Rate Interface.

Switching Between Devices

Use the **change device (chdev)** command to access specific devices, such as modems, or change to a specific command level prompt. You can issue the **chdev command** from any command level.

See Chapter 3 for more information.

Configuration overview

After obtaining line information from the telephone company, configure HiPer DSP:

Step 1: Select T1 line signaling

Step 2: Configure the desired feature group

Step 3: Configure for DNIS and ANI

Step 4: View the settings

Step 5: Modify Feature Group Profile settings

Step 6: Modify advanced modem settings

Step 7: Test the configuration

Step 8: Save the configuration

*To select templates, you must use Total Control Manager. For more information about selecting templates do the following: From the Total Control Manager help search, enter **templates**, and a templates help window appears.*

What Happens First? Order T1 trunk service from your telephone company.

Viewing Line Settings To view line settings, use the following parameter:

```
span1> display ccrcfig
```

Required Line Information When you order your telephone company interface or PSTN interface, obtain the line information from your telephone company. Record your line information below for future reference.

Information	Span variable	Typical value	Your value
Line coding	lcoding	B8ZS	
Framing	ltype	ESF	
Trunk type	dtrnktyp	E+M II	
Trunk start	diotrst	Wink	
Dial-in address Acknowledge wink	daackwnk	Disabled	
T1 setup	n/a	Normal	
T1 tone type	tonetype	DTMF	
# of DTMF tones	numdtmft	4	
Dial in/out address	dnisena	DNIS	

The information is also known as E&M, generic profile.

Optional Line Information If you have requested additional Dialed Number Identification Service or Automated Identification service, the following information should also be available:

Number of	Number of digits (supplied by telephone company)
ANI digits	
DNIS digits	

Step One: Select T1 Line Signaling

1 Move to the span level.

```
>chdev span
```

2 Select robbed-bit signaling.

```
span1>set sigmode robbit
```

If you change the signaling mode of HiPer DSP, save the settings and reboot HiPer DSP for this change to take effect. Either manually reboot the card by pulling it and reconnecting it, or from the root directory of the command line interface, enter ***reboot****.*

Step Two: Configure the Feature Group

By default, E&M, generic profile is the default HiPer DSP Feature Group. If the Feature Group supplied by your telephone company is not E&M, generic profile, select the correct Feature Group profile listed below.

To select	Command
E&M, Feature Group D profile	set cprofile fgdt2
E&M, Feature Group B profile	set cprofile fgbt2
Loop start	set cprofile lpstart
Ground start	set cprofile gndstart
E&M, generic profile	set cprofile genert2

Step Three: Configure for DNIS and ANI

1 Configure the DNIS on the span line.

To configure the DNIS enable type for	Command
No address sent at call set up	set dnisena noaddr
DNIS address sent at call set up	set dnisena dnisaddr
ANI address sent at call set up	set dnisena aniaddr
ANI and DNIS address sent at call set up	set dnisena daniaddr

2 Set the tone type on the span card

To select	Command
DTMF tones	set tonetype dtmftone
MF tones	set tonetype mftone

3 If your lines support DTMF tones, set the number of DTMF tones supported (0-127). For example:

```
span1>set numdtmft 4
```

4 Set the acknowledgment wink

To do this	Command
Enable acknowledgment wink after the dial in address	set daackwnk enable
Disable acknowledgment wink after the dial in address	set daackwnk disable

Step Four: View the Settings

If necessary, view the settings you just modified.

To view this setting	Command
Line signaling	display sigmode
DNIS settings	display dnisena
Tone type	display tonetype
Channelized T1 profile	display cprofile

Step Five: Modify the Span Line Settings

If you selected Feature Group B or D, you have automatically configured HiPer DSP with standard settings that will work with most telephone line configurations.

Two span line settings that often need modification are line coding and line type.

1 View your line coding.

```
span1>display lcoding
```

2 If HiPer DSP line coding does not match your settings, change your line coding method.

To set this RFC 1406 line coding method	Command
Binary Eight Zero Code Suppression	set lcoding b8zs
Alternate Mark Inversion	set lcoding ami

3 View your line type.

```
span1>display ltype
```

4 If HiPer DSP line type does not match your settings, change your line type.

To set DS1 line type to	Command
Extended SuperFrame DS1	set ltype esf
AT&T D4 format DS1	set ltype d4

Step Six: Modify Advanced Modem Settings

You can configure HiPer DSP modems in many ways.

To Configure	Go to Chapter
DNIS and ANI settings	Chapter 9, Controlling Incoming Calls with DNIS and ANI
Result code display	Chapter 10, Controlling Result Codes
Memory	Chapter 11, Working with Memory
Call control settings	Chapter 12, Changing Modem Call Control Settings
Link option settings	Chapter 13, Changing Link Option Settings
Error control settings	Chapter 14, Changing Error Control Settings
Data compression settings	Chapter 15, Changing Data Compression Settings
x2/V.90 settings	16, Configuring x2/V.90
ISDN settings	17, Configuring ISDN
NFAS	18, Configuring NFAS with D-Channel Backup

Step Seven: Test the Configuration

1 Using a modem or a telephone, dial into a telephone number on the span.

Use the HiPer DSP command-line interface for the following steps.

2 Change to the timeslot level.

```
> chdev tslot
```

3 Display timeslot and modem status.

```
span1/tslotx>display atstat
```

4 Look for your incoming call to be displayed in the `Connect In` column of the Console Interface.

Step Eight: Save the Configuration

When you are done configuring HiPer DSP, save the configuration of the span and the modems:

1 Save the span configuration by moving to the span level and entering the following command.

```
span1>cmd svspcfg
```

If you have changed the signaling mode of HiPer DSP, reboot HiPer DSP for this change to take effect.

2 Save the modem configuration by moving to the modem level and entering the following command.

```
mdmx>at&w
```

3 Reboot the card by moving to the root prompt and entering the following command.

```
>reboot
```

5 CONFIGURING PRIMARY RATE INTERFACE

Use this chapter to configure HiPer DSP for use with T1/PRI lines and E1/PRI lines after you have installed HiPer DSP in a Total Control chassis.

If your site is using Channelized T1 lines, see Chapter 4, Configuring Channelized T1.

Execute all commands in this chapter from the span card level (span1>).

Switching Between Devices

The change device (chdev) command is used to access specific devices or change to a specific command level prompt. You can issue the chdev command from any command level.

To change to the	Command
Root command prompt	chdev root
Modem command prompt	chdev mdm
Span card command prompt	chdev spncard
Span line command prompt	chdev span
Timeslot command prompt	chdev tslot

Configuration Overview

After you obtain line information from the telephone company, you can configure HiPer DSP in these easy steps:

Step 1: Select PRI line signaling

Step 2: Select the desired switch type

Step 3: Select the framing type

Step 4: Select a short or long haul NIC

Step 5: View the settings

Step 6: Modify advanced modem settings

Step 7: Test the configuration

Step 8: Save the configuration

To select templates, you must use TCM. For more information about selecting templates do the following: From the TCM help search, enter "templates", and a templates help window appears.

What Happens First? Order PRI service from your telephone company.

Viewing Line Settings To view line settings, use the following parameter:

```
span1> display ccrcfig
```

Required Line Information When you order your telephone lines, obtain the line information from your telephone company. Record your line information below for future reference.

Information	Span variable	Typical value	Your value
Line coding	lcoding	B8ZS	
Framing	ltype	ESF	
Switch type	swtype	5ESS	

By default, the signal mode is set to message-oriented signaling.

Step One: Select PRI Line Signaling

1 Move to the span level.

```
> chdev span
```

2 Select message-oriented signaling.

```
span1> set sigmode msgorien
```

If you change the signaling mode of HiPer DSP, save the settings and reboot HiPer DSP for this change to take effect.

Step Two: Select The Switch Type

Use the following table to set the PRI switch type.

To set the PRI switch type to	Command
4ESS (AT&T)	set swtype 4ess
5ESS (AT&T)	set swtype 5ess
DMS 100 Custom (Northern Telecom)	set swtype dms100
NI 2	set swtype ni2
INS1500 (Japan)	set swtype ins1500
NET5/CTR 4 (European ISDN)	set swtype ictr4
VN4 (France)	set swtype vn4
TS014 (Australia)	set swtype ts014

Step Three: Select the Framing Type

Use the following table to set the frame type.

To set DS1 line type to	Command
Extended SuperFrame DS1 (T1/PRI)	set ltype esf
AT&T D4 format DS1 or Super Frame (T1/PRI)	set ltype d4
CCITT Recommendation G.704 - (E1/PRI)	set ltype e1

This table refers to the line type tables found in RFC 1406. Consult RFC 1406 for more information.

Step Four: Configure for Short-Haul or Long-Haul

1 Configure for the long-haul or short-haul NIC.

To configure for	Command
Long-haul	set nicfgtyp long
Short-haul	set nicfgtyp short

2 If you're using a short-haul NIC, set the signal level distance.

To set signal level used to	Command
0 to 133 feet	set shauldis 0to133
133 to 266 feet	set shauldis 133to266
266 to 399 feet	set shauldis 266to399
399 to 533 feet	set shauldis 399to533
533 to 655 feet	set shauldis 533to655

3 If you are using a long-haul NIC, set the transmit line build out signaling.

To set the transmit line build out signaling to	Command
0.0 db xmit [dB0]	set txlibo 0.0db
-7.5 db xmit [negdB7]	set txlibo -7.5db
-15.0 db xmit [negdB15]	set txlibo -15.0db
-22.5 db xmit [negdB22]	set txlibo -22.5db

The default value for transmit line build out is 0.0db. Use the signaling strength you deem appropriate. Remember that the more decibels you use, the greater the possibility for crosstalk; and, the fewer decibels you use, the greater the possibility for attenuation.

Step Five: View the Settings

If necessary, view the settings you just modified.

To view this setting	Command
Line signaling	display sigmode
Switch type	display swtype
Line type	display ltype

Step Six: Modify Advanced Modem Settings

You can configure HiPer DSP modems in many ways.

To Configure	Go to Chapter
DNIS and ANI settings	9, Controlling Incoming Calls with DNIS and ANI
Result code display	10, Controlling Result Codes
Memory	11, Working with Memory
Call control settings	12, Changing Modem Call Control Settings

To Configure	Go to Chapter
Link option settings	13, Changing Link Option Settings
Error control settings	14, Changing Error Control Settings
Data compression settings	15, Changing Data Compression Settings
x2/V.90 settings	16, Configuring x2/V.90
ISDN settings	17, Configuring ISDN
NFAS	18, Configuring NFAS with D-Channel Backup

Step Seven: Test the Configuration

1 Use a telephone to dial into a number on the span.

Complete the following steps from the console interface.

2 Change to the timeslot.

```
> chdev tslot
```

3 Display timeslot and modem status.

```
span1/tslotx>display atstat
```

4 Look for your incoming call to be displayed in the Connect In column of the Console Interface.

Step Eight: Save the Configuration

When you are done configuring HiPer DSP, save the configuration of the span and the modems:

1 Save the span configuration by moving to the span level and entering the following command.

```
span1>cmd svspcfg
```

If you have changed the signaling mode of HiPer DSP, reboot HiPer DSP for this change to take effect.

2 Change to the modem.

```
span>chdev mdmx
```

3 Save the modem configuration by moving to the modem level and entering the following command.

```
mdmx>at&w
```

4 Reboot the card by moving to the root prompt and entering the following command.

```
>reboot
```

6 CONFIGURING R2

Use this chapter to configure HiPer DSP for use with E1/R2 lines after you have installed HiPer DSP in a Total Control chassis.

If your site is using T1 lines, see Chapter 4, Configuring Channelized T1, or Chapter 5, Configuring PRI.

Switching Between Devices

The change device (chdev) command is used to access specific devices or change to a specific command level prompt. You can issue the chdev command from any command level.

To change to the	Command
Root command prompt	chdev root
Modem command prompt	chdev mdm
Span card command prompt	chdev spncard
Span line command prompt	chdev span
Timeslot command prompt	chdev tslot

Configuration Overview

After you obtain line information from the telephone company, you can configure HiPer DSP in these easy steps:

Step 1: Select the country specific parameters

Step 2: Select the framing type

Step 3: Select a short- or long-haul NIC

Step 4: View the settings

Step 5: Modify advanced modem settings

Step 6: Test the configuration

Step 7: Save the configuration

To select templates, you must use TCM. For more information about selecting templates do the following: From the TCM help search, enter "templates", and a templates help window appears.

What Happens First? Order R2 service from your telephone company.

Viewing Line Settings To view line settings, use the following parameter:

```
span1> display r2
```

Required Line Information When you order your telephone lines, obtain the line information from your telephone company. Record your line information below for future reference.

Information	Span variable	Typical value	Your value
Line coding	lcoding	HDB3	
Framing	ltype	E1 MF (with or without CRC)	

HiPer DSP E1/R2 supports only the default bit-oriented signal mode.

Step One: Select The Country Specific Parameters

To select the country specific parameters use the following command:

```
span1> projid <country specific parameter>
```

The following is a list of the parameters for the country specific profiles:

- ITU-T
- Argentina
- Australia
- Brazil
- Chile
- China
- Colombia
- India
- Korea
- Malaysia
- Mexico
- NewZealand
- Philippines
- Sweden
- Venezuela

(See note on the following page.)

For further details about configuring the R2 protocol, refer to Appendix L, Using E1/R2 Signalling.

Step Two: Select the Framing Type

Use the following table to set the frame type.

To set E1 line type to	Command
G.704 CAS	set ltype mfe1
G.704 CAS with CRC-4	set ltype crcmfe1

This table refers to the line type tables found in RFC 1406. Consult RFC 1406 for more information.

Step Three: Configure for Short-Haul or Long-Haul

Use the following table to configure for the long-haul or short-haul NIC.

To configure for	Command
Long-haul	set nicfgtyp long
Short-haul	set nicfgtyp short

Step Four: View the Settings

If necessary, view the settings you just modified.

To view this setting	Command
Project ID	projid
Line Type	ltype

Step Five: Modify Advanced Modem Settings

You can configure HiPer DSP modems in many ways.

To Configure	Go to Chapter
DNIS and ANI settings	Chapter 9, Controlling Incoming Calls with DNIS and ANI
Result code display	Chapter 10, Controlling Result Codes
Memory	Chapter 11, Working with Memory
Call control settings	Chapter 12, Changing Modem Call Control Settings
Link option settings	Chapter 13, Changing Link Option Settings

To Configure	Go to Chapter
Error control settings	Chapter 14, Changing Error Control Settings
Data compression settings	Chapter 15, Changing Data Compression Settings
x2/V.90 settings	Chapter 16, Configuring x2/V.90
ISDN settings	Chapter 17, Configuring ISDN
NFAS	Chapter 18, Configuring NFAS with D-Channel Backup

Step Six: Test the Configuration

1 From a telephone, dial into a number on the span.

Complete the following steps from the console interface.

2 Change to the timeslot.

```
> chdev tslot
```

3 Display timeslot and modem status.

```
span1/tslotx>display atstat
```

4 Look for your incoming call to be displayed in the Connect In column of the Console Interface.

Step Seven: Save the Configuration

When you are done configuring HiPer DSP, save the configuration of the span and the modems:

1 Save the span configuration by moving to the span level and entering the following command.

```
span1>cmd svspcfg
```

2 Save the modem configuration by moving to the modem level and entering the following command.

```
mdmx>at&w
```

3 Reboot the card by moving to the root prompt and entering the following command.

```
>reboot
```

7 USING AT COMMANDS

This chapter contains:

- Sending AT commands to the modems
- Online Mode
- Dialing commands
- Answering calls
- Disconnecting calls

AT Command Overview

You can use AT commands to change your modem settings at any time.

When HiPer DSP is in Command Mode you can send AT commands to modem(s) while not connected to another device.

Sending AT Commands to the Modem

In order to use AT commands, you must do two things:

- Establish a connection with the modem using the Console Port.
- Run a terminal program such as HyperTerminal, that allows you to communicate with HiPer DSP.

Most communications programs send an initialization string to the modem when you load the program. Remove your software's initialization string so it does not interfere with the modem's power-on defaults.

Dialing

HiPer DSP has several dialing commands.

Basic Commands

These are the basic commands needed to dial HiPer DSP:

To do this	Command
Obtain dial command help	ATD$
Dial a number and enter Originate mode	ATD<number>

Optional Commands

Include these commands after the D command and before the number to be dialed unless indicated otherwise. To cancel dial command execution, press any key.

To do this	Command	Example
Pause for duration set in Register S8 (2 seconds).	,(Comma)	ATD9,5551234
Wait for second dial tone before dialing the rest of the dial string. Use this command when result codes are set to X3 or higher.	W	ATDT9W5551234

Using Stored Phone Numbers

Each modem can store up to four dial strings in NVRAM, store the last dialed number, and do an inquiry of stored phone numbers.

The dial string may be up to 40 characters long. The string may include any valid Dial command options, but no other commands.

To do this	Command	Example
View stored telephone numbers	I5	ATI5
Write the following Dial string (s) to NVRAM at position n (n = 0–3).	&Zn=s	AT&Z3=5551234
Write the last dialed number to NVRAM at position n (n = 0–3).	&Zn=L	AT3=L
Display the phone number stored in NVRAM at position n (n = 0–3).	&Zn?	AT&Z0=555-1234
Dial the phone number stored in NVRAM at position n (n = 0–3).	DSn	ATDS1
Dial the last-dialed number	DL	ATDL

To do this	Command	Example
Display the last dialed number	DL?	ATDL?
Disconnecting calls Hang up (go on hook).	H	ATH

You can issue ATH only from the Console Interface.

8 VIEWING MODEM SETTINGS AND STATISTICS

This chapter contains:

- Viewing modem settings
- Viewing modem statistics

For more detailed help about viewing modem settings and statistics, see Appendix F, Modem Commands, and Appendix G, Viewing Modem Settings.

Help for Viewing Modem Settings

Use AT commands to access AT command help.

To view help for	Command
Advanced AT commands, such as error control, data compression, and link speeds	AT&$
ISDN configuration settings	AT*$
Basic AT commands, such as dialing, redialing, hanging up, and controlling result codes	AT$
ANI/DNIS settings	AT%$
S-Register commands	ATS$

To view a comprehensive list of the commands to view modem settings, refer to Appendix G, Modem Settings.

Viewing Modem Statistics

When an inquiry command is issued, the modem displays information on the terminal screen. The following commands are available.

To display	Command
Call duration.	ATI3
Current modem settings.	ATI4

To display	Command
Stored modem settings in the NVRAM.	ATI5
Link diagnostics of the current or previous call, including characters transferred, data blocks retransmitted under error control, disconnect reasons, line source, and other information. See Understanding link diagnostic results later in this chapter for more information.	ATI6
Product configuration displays code date, revision, the slot and channel number of the modem, and other information useful to 3Com's Technical Support to diagnose problems.	ATI7
Standard Feature Group B settings.	ATI9
Advanced link diagnostics. See Understanding Disconnect Reasons later in this chapter.	ATI11

ATI0, ATI1, ATI2, ATI8, ATI10, and ATI12 are not used in HiPer DSP.

Understanding Link Diagnostic Results

Some results listed in the I6 display are not self-explanatory and have the following meanings:

This result	Indicates
Octets	Compressed characters; due to buffering, may be greater than the number of characters sent.
Blers	Errors in data and protocol (non-data) blocks, but corrected by ARQ (error control).
Link Timeouts	Error correction protocol severed momentarily (during which no data was transferred), but the protocol was able to recover.
Link Naks	Negative acknowledgments (one or more blocks).
Data Compression	The type of data compression negotiated for the call (V42BIS or MNP5) or NONE. A V42BIS response includes the size of the dictionary and the maximum string length used, e.g., 2048/32.
Equalization (Long/Short)	The status of S15 bit 0; long if bit 0=0, short if bit 0=1.
Fallback (Enabled/Disabled)	Whether or not the modems negotiated online fallback during the con-nection sequence.
Protocol	The error control protocol negotiated (LAPM, MNP, NONE) or SYNC for a synchronous call.
Speed	The last rates at which the receiver/transmitter were operating before disconnecting.

Understanding Disconnect Reasons

Possible reasons for disconnect are as follows:

This reason	Indicates
Keypress Abort	The modem detected a keypress before or during training.
Escape code	The operator sent the modem the +++ escape code.
GSTN (General Switch Telephone Network) Clear Down	The connection was non-ARQ and DTR was dropped from one side of the connection, or the DISC frame was corrupted due to noise.
Loss of carrier	The modem detected loss of the remote modem's carrier and waited the duration specified in S10 (default is 0.7 seconds).
Inactivity timeout	The modem detected no activity on the line for the duration specified in S19 (default is 0, timer disabled).
MNP incompatibility	The modem is set to &M5 and the remote modem does not have MNP capability, or there was an MNP negotiation procedure error.
Retransmit limit	The modems reached the maximum of 12 attempts to transfer a data frame without error.
LD received	The remote modem sent an MNP error control Link Disconnect request.
DISC	The remote modem sent a V.42 Disconnect frame.
Loop loss disconnect	The modem detected a loss of current on the loop connecting it with the telephone company central office. This usually occurs because the remote modem has hung up.
Unable to Retrain	After several attempts, disturbances on the phone line prevented the modems from retraining, and they could no longer transmit or receive data.
Invalid speed	The modem is set to a specific speed or a range of speeds and the remote modem is not operating at the same rate.
XID Timeout	The modems failed to negotiate the V.42 Detection (XID Exchange) phase.
SABME Timeout (Set Asynchronous Balance Mode Extended)	The modems failed this part of V.42 link negotiation.
Break Timeout	Incompatible processing of a Break signal occurred.
Invalid Codeword	The modem received an invalid V.42 bis frame.
A Rootless Tree	The modem received an invalid V.42 bis frame.
Illegal Command Code	The modem received an invalid V.42 bis frame.

This reason	Indicates
Extra Stepup	The modem received an invalid V.42 bis frame.
Call Teardown	The T1 Card initiated a disconnect.
Normal User Call Clear	The network cleared a call when it received a disconnect from a Gateway card.

For more information about call fails and modem disconnects, refer to Appendix C, Trouble Clearing Call Fails and Modem Disconnects.

9 CONTROLLING INCOMING CALLS WITH DNIS AND ANI

This chapter contains:

- Using the Carrier Access Code (CAC)
- Using the Carrier Access Code to control calls
- Identifying the CAC on incoming calls
- Viewing CAC information
- Viewing the last CAC used

DNIS and ANI service is used only with T1 lines.

Overview of Dialed Number Identification Service and Automated Number Identification

Use Dialed Number Identification Service (DNIS) and Automatic Number Identification (ANI) to control call routing.

This service	Provides the modem with the number
DNIS	That the calling telephone dialed
ANI	Of the calling telephone

Obtaining DNIS and ANI

Contact your telephone company to obtain DNIS service.

Contact your long distance service provider to obtain ANI service.

Using the Carrier Access Code

Listed below is a typical scenario involving the Carrier Access Code (CAC):

- When an incoming call arrives, HiPer DSP compares the number dialed against the user-defined CAC numbers
- HiPer DSP configures the modem based on the CAC initialization string that corresponds to the CAC number dialed

Using the Carrier Access Code to Control Calls

Use the CAC numbers to program your modem to route calls upon receiving DNIS or ANI information.

Three CAC initialization strings must match the position of a specified CAC number. The fourth CAC initialization string can contain a CAC number that is executed if the modem receives an unknown CAC.

1 Determine if you want to use DNIS or ANI:

To select	Command
ANI	ATS47.4=1
DNIS (default)	ATS47.4=0

2 Configure the DNIS and ANI CAC numbers.

Command: AT%CNx=y

Values for x: 1 to 3

Values for y: A numeric string containing up to ten digits

3 Configure the DNIS and ANI CAC initialization strings.

Command: AT%CIx=y

Values for x: 1 to 4

Values for y: A modem initialization string containing up to 30 characters

Identifying the Carrier Access Code on Incoming Calls

HiPer DSP identifies the CAC on incoming calls by returning special RING result codes, as follows.

When this information is recieved	The modem returns this RING result code
No DNIS or ANI	RING (normal).
DNIS only	RING/x (where x r epresents the DNIS number).
ANI and DNIS	RING/x/y (where x represents the DNIS and y the ANI).
ANI only	RING//y (where two slashes indicate no DNIS, and y is the ANI).

Viewing Carrier Access Code Information

View the CAC numbers and the associated initialization strings by accessing the ATI9 screen.

Viewing the Last Carrier Access Code Used

You can view the CAC associated with the last call received by viewing the Current Settings screen (ATI4), as follows:

```
LAST DNIS #: nn..nn
or
LAST ANI #: nn..nn
```

10 CONTROLLING RESULT CODES

This chapter contains:

- Types of result codes
- Temporarily enabling or disabling result codes
- Verbal or numeric result codes
- Extended connect messages

Overview

Result codes are status messages. HiPer DSP modems send result codes to your terminal, for example, to indicate the status of a connection. Result codes may contain:

- Compression information
- Connect speed
- DNIS or ANI information
- Protocol information

The following are examples of ways you may use result codes:

Accounting	Service providers may charge different rates to callers depending on the speed at which they connect. The result code is used to log the connect speed and the customer is charged accordingly.
Statistics	Using result codes, an administrator can generate statistics such as the number of callers using x2 modems or the busiest hours during the work week.
Alarms	Using connect messages, a system administrator can be alerted to command errors, loss of dial tone, or unusually low connect rates.
Caller Identification	Using Called Party Number, you can screen calls, keep a record of calls, or prevent unauthorized access to your network.

Types of Result Codes

When enabled, the modem returns result codes to the terminal display in response to various modem events.

These result codes	Are returned	Example
Command results	In response to AT commands	OK and ERROR
Call progress reports	During originate and answer modes	RINGING, RING, BUSY, NO ANSWER, and NO CARRIER
Connect messages	When the modem makes a connection	CONNECT Optional settings allow the basic CONNECT message to be appended with various indicators that report connection diagnostics such as the speed at which the modems connect, protocol used, and whether the connection is under ARQ (error control)

Temporarily Enabling or Disabling Result Codes

The modems are shipped with result codes disabled. You must enable result codes if you plan to monitor calls through the Console Interface.

To do this	Command
Display result codes	ATQ0
Suppress result codes	ATQ1
Display result codes during originate mode only	ATQ2

There may be some software incompatibility with result codes. You may need to adjust certain settings or contact your software manufacturer for support if you run into problems.

Using Verbal or Numeric Result Codes

You can configure HiPer DSP to display verbal or numeric result codes.

See Appendix H, Result Codes, for a complete list of result codes.

To display:	Command
Numeric result codes	ATV0
Verbal result codes	ATV1

Extended Connect Messages

Use the &An command to enable extended connect message indicators. The verbal result code is appended with an indicator according to the settings below.

To set these additional connect messages	Use these if	Command
No additional result code indicators	Software is incompatible with these indicators.	AT&A0
ARQ indicator (Default)	The modem is set to X0: connection is between 1200 and 21.6 kbps. The remaining connect rates require a setting of X1 or higher.	AT&A1
Protocol indicator (HDM has no numeric result codes for &A3 protocol indicators)	You need protocols in your connect messages. Reports LAPM or MNP and V42BIS or MNP5. Also reports SYNC and NONE.	AT&A3

11 WORKING WITH MEMORY

This chapter contains:

- Working with flash memory settings
- Customizing, changing, and resetting flash memory

Overview

To manage the memory on HiPer DSP, you need to understand the following memory settings.

Current Settings Current settings are saved in RAM. Any settings that you change and do not save to the modem are active until you reset or power off a modem. View current settings by sending **`ATI4`**.

Saved Settings Saved settings that are stored in flash memory. View saved settings by sending **`ATI5`**.

Permanent Settings Permanent settings, such as serial number and product code, are stored in ROM and cannot be changed.

Working with Flash Memory Settings

Saving the Configuration in Flash Memory

Save a configuration template in flash memory just as you would save any other AT command. For example:

```
mdm7>at&f1&w
```

The default configuration (&F1) cannot be customized since they are a part of the modem's ROM. However, settings may be loaded into active

memory, modified, and saved to flash memory. This may be performed with a single command string. For example:

```
mdm7>at&f1&k3s10=40&a2&w
```

Insert your changes after the &F1 command but before &W. If you don't, the changes are overwritten by &F1.

Saving a Phone Number to Flash Memory

Use the following table to save a phone number to Flash memory.

To do this	Example
Store the phone number 555-6789 at position 2.	AT&Z2=555-6789
View the saved phone numbers.	ATI5
Dial the phone number you saved with a special setting. In this example, &M0 (no error control) comes before DS2.	AT&M0DS2
Dial the phone number you saved.	ATDS2

Write the phone number (s) to position (n) in memory. You can store up to ten phone numbers of up to 40 characters each in positions 0-3. AT&Zn=s

Do not include modem commands in AT&Zn=s.

Displaying Saved Information

Use the following table todisplay saved information.

To display	Command	Example
S-Register Value stored in position r	ATSr?	ATS0?
Phone Number stored in position n	AT&Zn?	AT&Z3?

12 Changing Modem Call Control Settings

This chapter contains:

- Advanced dialing commands
- Advanced answering commands
- Other call control settings

Advanced Dialing

Setting Time to Start Dialing

Use the following command:

ATS6=n

This function sets the number of seconds the modem waits to dial after detecting a dial tone. This applies to loop-start CHT1.

Settings: 0-255

Default: 2

Setting Carrier Wait Time After Dialing

Duration in Seconds

To set the duration, in seconds, that HiPer DSP waits to detect a carrier signal from the remote modem, enter the following command:

ATS7=n

Settings: 0-255 seconds

Default: 60

Duration in Tenths of a Second

Use the following command to set the duration in tenths of seconds:

ATS28=n

This command sets EIA-specified multimode training sequences for V.32 modems. The delay gives V.32 modems additional time to connect with most U.S./Canada modems at 9600 bps before falling back to attempt a V.21 connection (to answer overseas calls, 300 bps), 1200 bps with a 75-bps back channel). The fallback occurs only if the modem is set for V.21 (S27, bit 0 enabled).

Settings: 0-255

Default: 8

Other Call Control Settings

To set idle time before disconnect, use the following command:

ATS19=n

Use this command to set modem timeout. If no data activity is detected by the timeout period (specified in minutes), the modem hangs up.

If the value of this function is set greater than 0, the Inactivity Timer is activated when there is no data activity in either the transmit or receive direction.

Settings: 0-255 minutes

Default: 0

13 Changing Link Option Settings

This chapter conatins:

- Controlling link speeds
- Configuring carrier delay

Controlling Link Speeds

You can control the speeds at which HiPer DSP modems connect to other modems.

Setting the Highest Possible Connect Speed

The &N command allows you to set the highest possible connect speed. When a remote modem connects to HiPer DSP, it limits the maximum speed of the connection based on the value specified with &N.

Setting the Lowest Possible Connect Speed

The &U command allows you to set the lowest possible connect speed. When a remote modem connects to HiPer DSP, it limits the minimum speed of the connection based on the value specified with &U.

The default for &N and &U are 0.

Setting a Range of Possible Connect Speeds

By setting &N and &U values, you can control the range of speeds at which HiPer DSP connects with remote modems. When a remote modem connects to HiPer DSP, it limits the range connection speeds based on the &U and &N values.

For asymmetric links, &N and &U are used to constrain the speed of the higher speed direction of the link. The speed of the lower speed direction is constrained by values given in S registers.

Use the following table to understand the relationship between &U and &N commands:

If &U	And &N	Then your modem
Equals zero	Equals zero	Connects at the highest possible speed
	Is greater than zero	Connects at the &N speed only
Is greater than zero	Is greater than zero and greater than &U	Connects at the highest possible speed in the range from &U to &N

Use the following table for a complete list of &N and &U link speeds and their associated indices:

Link Speed	Index	Link Speed	Index	Link Speed	Index
Highest	0	21600	11	45333	22
300	1	24000	12	46666	23
1200	2	26400	13	48000	24
2400	3	28800	14	49333	25
4800	4	31200	15	50666	26
7200	5	33600	16	52000	27
9600	6	33333	17	53333	28
12000	7	37333	18	54666	29
14400	8	41333	19	56000	30
16800	9	42666	20	57333	31
19200	10	44000	21	64000	32

Base Rates and True Rates for x2/V.90

The x2 / V.90 (V.90) speeds listed in the &U and &N table are base rates. From each base rate an additional 6 true rates can be derived. Thirty true rates exist, not 64 (16 times 4) V.90 true rates. The same V.90 true rate could be derived from multiple base rates. Thus it is possible to get a V.90 connection at a true rate that is less than the minimum rate implied by the &U value.

Base rate is also known as the DataTerminal Equipment rate (DTE rate), and true rate as the Data Communication Equipment rate (DCE rate).

Controlling x2/V.90 Low-speed Direction Minimum Speed

Use the following settings to control x2 / V.90 low-speed direction minimum speeds:

Minimum speed	Value	Minimum speed	Value
Normal	ATS74=0	33.333 kbps	ATS74=17
300 bps	ATS74=1	37.333 kbps	ATS74=18
1200 bps	ATS74=2	41.333 kbps	ATS74=19
2400 bps	ATS74=3	42.666 kbps	ATS74=20
4800 bps	ATS74=4	44 kbps	ATS74=21
7200 bps	ATS74=5	45.333 kbps	ATS74=22
9600 bps	ATS74=6	46.666 kbps	ATS74=23
12 kbps	ATS74=7	48 kbps	ATS74=24
14.4 kbps	ATS74=8	49.333 kbps	ATS74=25
16.8 kbps	ATS74=9	50.666 kbps	ATS74=26
19.2 kbps	ATS74=10	52 kbps	ATS74=27
21.6 kbps	ATS74=11	53.333 kbps	ATS74=28
24 kbps	ATS74=12	54.666 kbps	ATS74=29
26.4 kbps	ATS74=13	56 kbps	ATS74=30
28.8 kbps	ATS74=14	57.333 kbps	ATS74=31
31.2 kbps	ATS74=15	64 kbps	ATS74=32
33.6 kbps	ATS74=16		

Controlling x2/V.90 Low-speed Direction Maximum Speed

Use the following settings to x2 / V.90 control low-speed direction maximum speeds:

Maximum speed	Command	Maximum speed	Command
Normal	ATS75=0	33.333 kbps	ATS75=17
300 bps	ATS75=1	37.333 kbps	ATS75=18
1200 bps	ATS75=2	41.333 kbps	ATS75=19
2400 bps	ATS75=3	42.666 kbps	ATS75=20
4800 bps	ATS75=4	44 kbps	ATS75=21
7200 bps	ATS75=5	45.333 kbps	ATS75=22
9600 bps	ATS75=6	46.666 kbps	ATS75=23
12 kbps	ATS75=7	48 kbps	ATS75=24

Maximum speed	Command	Maximum speed	Command
14.4 kbps	ATS75=8	49.333 kbps	ATS75=25
16.8 kbps	ATS75=9	50.666 kbps	ATS75=26
19.2 kbps	ATS75=10	52 kbps	ATS75=27
21.6 kbps	ATS75=11	53.333 kbps	ATS75=28
24 kbps	ATS75=12	54.666 kbps	ATS75=29
26.4 kbps	ATS75=13	56 kbps	ATS75=30
28.8 kbps	ATS75=14	57.333 kbps	ATS75=31
31.2 kbps	ATS75=15	64 kbps	ATS75=32
33.6 kbps	ATS75=16		

Controlling x2/V.90 Low-speed Channel

Use the following table to control the x2 / V.90 low-speed channel of asymmetric connections:

To Disable	Setting	Example
2743 symbol rate	1	ATS77.0=1
2800 symbol rate	2	ATS77.1=1
3429 symbol rate	4	ATS77.2=1
Low carrier 3000	8	ATS77.3=1
High carrier 3000	16	ATS77.4=1
Low carrier 3200	32	ATS77.5=1
High carrier 3200	64	ATS77.6=1
3429 remote transmitter symbol rate	128	ATS77.7=1

Configuring Carrier Delay

Carrier Receive Delay

Use the following command to modify carrier receive delay (0.1 sec)

ATS9=n

This function sets the duration, in tenths of a second, that the remote modem's carrier signal must be present before the local modem recognizes the signal. This delay is ignored at speeds above 2400.

Settings: 0-255

Default: 6

Setting Duration of Loss of Carrier Before Disconnect (0.1 sec)

Use the following command:

`ATS10=n`

This function sets the duration, in tenths of a second, that the modem waits after the loss of the remote modem's carrier signal before hanging up. This setting allows the modem to distinguish between a momentary lapse due to line quality and a true disconnect by the remote modem.

Settings: 0-255

Default: 7

Setting Touch Tone Dial Timing (ms)

Use the following command to set the duration and spacing, in milliseconds, of dialed touch tones:

`ATS11=n`

Settings: 0-255

Default: 70

Disabling 2100 Hz Answer Tone

Use the following command:

`ATS27.3=1`

This setting allows the operator to disable the 2100 Hz answer tone, allowing V.42 modems to connect more quickly and/or eliminating problems with older 2400-bps modems that do not recognize this tone.

Default:ATS27.3=0 (Enable)

14 CHANGING ERROR-CONTROL SETTINGS

This chapter contains:

- Error-control overview
- Using error control

High speed calls are highly vulnerable to errors unless the data is protected by error control. If HiPer DSP connects with a remote device at a high speed without using error control, and you are not using an error control protocol for your call, you may lose data.

Error-Control Overview

Automatic Repeat Request

Automatic Repeat Request (ARQ) is a method used in many error-control protocols to ensure that the sending modem retransmits any corrupted data.

When to Use Error Control

Error control is available for calls at 1200 bps and above. It can be disabled, although high-speed calls (above 2400 bps) should always be under error control. The operations defined in an error-control protocol include the following:

- Establishing compatibility
- Formatting data frames
- Detecting errors using Cyclic Redundancy Checking (CRC)
- Retransmitting corrupt data frames

HiPer DSP is set at the factory to &M4, causing it to try an error-control connection and, if that isn't possible, to proceed with the call in Normal mode.

HiPer DSP first tries a V.42 connection, then an MNP connection. The following information is based on the setting of &M4.

V.42 Error Control

This international standard includes a two-stage handshaking process:

Stage 1: A Detection phase that is based on an exchange of predefined characters.

Stage 2: A LAPM (Link Access Procedures for Modems) negotiation phase, during which the devices identify their capabilities concerning maximum data block size and the number of outstanding data blocks allowed before an acknowledgment is required.

Microcom Networking Protocol Error Control

This protocol is supported by the ITU-T V.42 recommendation.

Microcom Networking Protocol (MNP) is based on special protocol frames. If the remote device doesn't recognize an MNP Link Request, error control isn't possible.

X.75 and V.120 Connections

X.75 and V.120 are standards for passing asynchronous data over ISDN B-channels, which are inherently synchronous. To make a connection using V.120 or X.75, the device at the other end of the connection must also support V.120 or X.75.

Because HiPer DSP supports the X.75 and V.120 protocols, it can map slower-speed asynchronous data to the 64 kbps B-channel. HiPer DSP's rate adaptation capability spans the range of 300 bps to 64 kbps.

X.75 Error Control

If the X.25 networks are connected by telephone lines, the error checking is very extensive and can appear to be slow.

V.120 Error Control

V.120 Error Control supports the following speeds: 75 bps/ 110 bps/ 600 bps/ 1200 bps/ 2400 bps/ 3600 bps/ 4800 bps/7200 bps/ 9600 bps/ 14.4 kbps/ 16 kbps/ 19.2 kbps/ 38.4 bps/ 48 kbps/ 56 kbps / 64 kbps

Using Error Control

Setting ARQ Negotiation

Use the following table to configure error-control settings.

To select	Command
No error control, asynchronous without error control	AT&M0
Normal ARQ (Default), the local modem attempts to connect under error control, but connects without if it can't be negotiated	AT&M4
ARQ only, the local modem attempts to use error correction and hangs up if the remote modem is not using error correction	AT&M5

Special 2400 bps Microcom Networking Protocol

Use this command to enable connections with older, non-3Com 2400 bps modems that are not fully compatible with the MNP protocol:

`ATS15.6=1`

Default: ATS15.6=0 (Standard 2400 bps MNP)

V.42/Microcom Networking Protocol Negotiation Method

Use the following command to program the modem to determine the error control handshaking mode:

`ATS27.4 and ATS27.5`

When set to disable either V.42 or MNP, the modem only attempts to negotiate the enabled protocol.

If you know the remote modem does V.42, set to Disable Detection Phase. The V.42 detection phase is skipped during the handshaking process, allowing for a faster connection.

ATS27.4=n	ATS27.5=n	Result
1	0	Disable MNP
0	1	Disable V.42
1	1	Disable Detection Phase

Default: Complete handshaking sequence (.4 and .5 = 0)

Non-Automatic Repeat Request Transmit Buffer Size

Use this command to reduce the size of the non-ARQ mode Transmit buffer to 128 bytes:

```
ATS15.3=1
```

The smaller value is designed for bulletin boards, to accommodate callers with slower modems so that they can control received data scrolling up and off the screen.

The default 1.5 kb non-ARQ buffer allows data transfer with X- and Y-MODEM file transfer protocols without using flow control.

Default: ATS15.3=0 (1500 byte non-ARQ transmit buffer)

Controlling Selective Reject

Selective reject provides significant throughput improvements over noisy lines. Selective reject allows the modems to retransmit only those blocks that contained errors, rather than having to retransmit data that was successfully transmitted during the time between when the block was sent and when it was detected as having been corrupted.

To do this	Command
Disable Selective Reject	ATS51.6=1
Enable Selective Reject (default)	ATS51.6=0

Disabling this feature is only necessary for certain troubleshooting purposes.

15 Changing Data Compression Settings

This chapter contains:

- Viewing data compression settings
- V.42 *bis* versus MNP5 compression
- Controlling data compression

Overview

While HiPer DSP makes an outgoing call, if it successfully establishes a V.42 error control connection with a remote device, it also negotiates for V.42 *bis* data compression.

Viewing Data Compression Settings

The following table explains data compression settings.

To view the compression for	Command
Current or previous call	AT16
Call while connecting	AT&A3 and view data compression type in CONNECT message

V.42 *bis* Compression

HiPer DSP modems use V.42 *bis* compression negotiate the following options and report them in the ATI6 display.

- Dictionary size is the amount of memory available for compression table entries. HiPer DSPs use an 11-bit, (2048-entry) dictionary, but they can reduce its size to accommodate a remote modem that uses a 9-bit (512-entry) or 10-bit (1024-entry) dictionary.
- Maximum string length of each entry. As the dictionary fills, HiPer DSP deletes the oldest unused strings.

V.42 *bis* Versus MNP5 Compression

V.42 *bis* compression is more efficient than MNP5 compression in part because it dynamically deletes entries that are no longer used. In

addition, V.42 *bis* works better with files that are already compressed. These include .ZIP files, which are compressed.

When transferring .ZIP files, set HiPer DSP to &K3. This allows V.42 *bis* compression to work dynamically with the compressed data, but disables MNP5.

Controlling Data Compression

When data compression is enabled, HiPer DSP negotiates for V.42 bis first, and, if unsuccessful, negotiates for MNP level 5 data compression.

Compression does not occur unless the modems are able to establish an error control (ARQ) connection.

When transferring compressed files, V.42 *bis* only compresses data when compression yields an advantage.

To select	Command
Compression disabled	AT&K0
Auto enable	AT&K1
Enable	AT&K2
MNP level 5 disabled (V.42 only)	AT&K3

Default: AT&K1 (Auto Enable)

16 CONFIGURING x2 / V.90

This chapter will help you understand more about x.2 and V.90, and ultimately, it will help you configure the HiPer DSP for those protocols.

This chapter contains:

- Overview of x2 and V.90
- Disabling V.34 connections
- Changing link option settings
- Determining if x2 / V.90 is enabled
- Enabling x2 / V.90
- How HiPer DSP with x2 / V.90 interacts with Total Control Manager and the Network Management Card

Overview of x2 and V.90

HiPer DSP supports x2, which is a 3Com proprietary technology that allows servers to send data at speeds up to 56 kbps and clients to send data at speeds up to 33.6 kbps.

HiPer DSP 2.0 supports the ITU-T V.90 standard for data communications using PCM modems. Your HiPer DSP v2.0 with V.90 allows your customers to surf the Internet and download information over analog or digital telephone lines at speeds up to 56 kbps downstream and up 33.6 kbps upstream. This new standard ensures compatibility with any manufacturer's server equipment, as long as that server equipment is also compliant with the standard.

Maximum download speeds of any 56K product are limited to 53K due to the FCC's limitation on the power output of service provider equipment. Actual speeds may vary depending on line conditions and other factors. Uploads travel at speeds up to 31.2 kbps. If you connect to any V.34 "plus" (33.6) modem, or to another 56K client modem, they will

connect using the V.34 "plus" protocol and are then capable of talking to each other at speeds up to 33.6 kbps.Downstream: The digital modem is transmitting data to the analog modem.

Definitions

Upstream: The analog modem is transmitting data to the digital modem.

A90: V.90 mode for an analog interface.

D90: V.90 mode for a digital interface.

DD90: V.90 mode for digital interfaces at both ends.

PSTN: Public Switched Telephone Network.

PCM: Pulse Code Modulation.

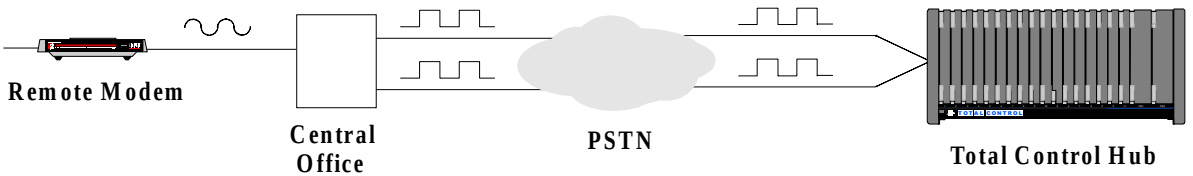
CODEC: Coder/Decoder.

PBX: Private Branch Exchange.

Trunk Side Versus Line Side

A trunk side digital connection is one that is 100% digital from the Central Office (through the PSTN) to the customer location—for an example of this, see below. If analog-to-digital conversions are anywhere in the signal path, 56 kbps will not work.

Trunk Side Digital Connection



Also, some telephone companies advertise trunk side T1 as totally digital when it is NOT. In these rare cases where trunk side T1 is not totally digital, it can be the result of analog-to-digital conversion units that exist on digital switches. These analog-to-digital conversions are also known as line side connections.

For More Information about x2 and V.90

For more information about x2 and V.90 visit the 3Com sites on the World Wide Web at http://www.3com.com/56k/.

Throughout the remainder of this chapter, V.90 refers to x2 and/or V.90.

Disabling V.34 Connections

HiPer DSP allow you to disable V.34 connections depending on whether they are made with an x2 / V.90 capable modem.

To do this	Command
Allow V.34 and x2 / V.90 connections	ATS54.7 = 0
Allow V.34 and x2 / V.90 connections only with x2 / V.90 modems	ATS56.6 = 0 (for x2 modems only); S56.7 = 1; S27.2 = 1; S13.5 = 1
Allow V.34 connections to all modems	ATS56.6 = 0; S76.3 = 0
Disable V.34 and x2 / V.90 connections to all modems	ATS54.7 = 1
Disable V.34 connections to non-x2 V.90 modems, but allow V.34 connections to x2 / V.90 modems	ATS56.6 = 1; S76.3 = 0
Disable V.34 connections to x2 / V.90 modems	ATS56.6 = 0; S76.3 = 1
Disable V.34 connections, but allow x2 / V.90 connections to all modems	ATS56.6 = 1; S76.3 = 1

S-Register S76, bit 3 can be set only via AT commands at this time, not with management software.

Changing Link Option Settings

See Chapter 13, Changing Link Option Settings, for more information about controlling connect x2 / V.90 speeds.

Determining If V.90 Is Enabled

If you aren't sure whether V.90 is enabled in your HiPer DSP, launch your terminal program and enter the **ATI7** command to display product configuration information. If V.90 is enabled on your HiPer DSP 1.2, the following information displays:

```
mdm1> ati7

Modem Configuration Profile

Product Type              Generic Rackmount
```

```
Serial Number             123456789ABC
Slot/Channel              7/1
Modem Options             V.32, V.34+, x2/V.90
ISDN Options              V.110, V.120, X.75, Sync PPP
Cellular Options          None
Fax Options               None
Span Options              PRI/T1, CHT1
Channel Capacity          24
RISC Clock Frequency      60MHz
DSP Clock Frequency       75MHz
Board Manager Flash ROM   2Mb
Board Manager RAM         8Mb

Boot Block Date           07/22/98
Board Manager Date        07/22/98
ACP Date                  07/22/98
DSP Date                  07/22/98

Boot Block Version        1.0.0
Board Manager Version     2.0.1
ACP Version               2.0.1
DSP Version               2.0.1

Regulatory Version        1.0
```

Enabling V.90

Your HiPer DSP 1.2 ships from the factory with x2/V.90 enabled.

- V.90 transmit levels
- V.90 connect result codes
- V.90 status values for screen ATI11

V.90 Enable/Disable S-Register Values

The following S-register bits allow you to enable or disable the V.90 modes.

To do this	Use this AT command
Apply the V.90 transmit power limit to the output of the server modem and the input to the digital packet assembler/deassembler (pad)	S81.0=1
Disable the digital interface	S81.5=1
Control the server's transmit power limit	S82=n 12<n<16

Controlling Link Speeds

V.90 server mode supports 22 different link rates in the downstream, or server-to-client, direction. The rates range from 28 kbps to 56 kbps, with an interval between rates of 8000/6 bps. The upstream, or client-to-server, direction supports 13 different link rates ranging from 4800 bps to 33600 bps, with an interval between rates of 2400 bps.

The following table provides a complete list of &N and &U link speeds and their associated indices

Link Speed	Index	Link Speed	Index	Link Speed	Index
Highest	0	26400	13	40000	26
300	1	28800	14	41333	27
1200	2	31200	15	42666	28
2400	3	33600	16	44000	29
4800	4	28000	17	45333	30
7200	5	29333	18	46666	31
9600	6	30666	19	48000	32
12000	7	32000	20	49333	33
14400	8	33333	21	50666	34
16800	9	34666	22	52000	35
19200	10	36000	23	53333	36
21600	11	37333	24	54666	37
24000	12	38666	25	56000	38

Setting Transmit Levels

The following table describes the S-register (s82) and S-register bit (s81.0) that enable you to control and define the point of application of the transmit level for V.90:

S-Register	Default	Function
S81	0	Contains a new bit and corresponding management bus indicator. When this bit is set (that is, S81=1), it indicates the V.90 transmit power limit is to be applied to the output of the server modem (that is, the input of the digital pad). Conversely when this bit is cleared (=0), it indicates the V.90 transmit power limit is to be applied at the input to the far end Coder/Decoder (CODEC) (that is, the output of the digital pad).
S82	6 -- France, U.K., Africa 12 -USA, and all other countries 15 -Japan	Sets the transmit power limit of the V.90 server. The value of this register is interpreted as negative dBm

New Connect Result Codes

The following table provides a list of all the connect messages that support V.90:

Extended Result code		Basic (x0)	non-ARQ (&A0)
256	CONNECT 28000	1	256
257	CONNECT 28000/ARQ	14	256
258	CONNECT 28000/V90	1	256
259	CONNECT 28000/ARQ/V90	14	256
260	CONNECT 29333	1	260
261	CONNECT 29333/ARQ	14	260
262	CONNECT 29333/V90	1	260
263	CONNECT 29333/ARQ/V90	14	260
264	CONNECT 30666	1	264
265	CONNECT 30666/ARQ	14	264
266	CONNECT 30666/V90	1	264

Extended Result code		Basic (x0)	non-ARQ (&A0)
267	CONNECT 3066/ARQ/V90	14	264
268	CONNECT 32000	1	268
269	CONNECT 32000/ARQ	14	268
270	CONNECT 32000/V90	1	268
271	CONNECT 32000/ARQ/V90	14	268
272	CONNECT 34666	1	272
273	CONNECT 34666/ARQ	14	272
274	CONNECT 34666/V90	1	272
275	CONNECT/ARQ/V90	14	272
276	CONNECT 36000	1	276
277	CONNECT 36000/ARQ	14	276
278	CONNECT 36000/V90	1	276
279	CONNECT 36000/ARQ/V90	14	276
280	CONNECT 38666	1	280
281	CONNECT 38666/ARQ	14	280
282	CONNECT 38666/V90	1	280
283	CONNECT 38666/ARQ/V90	14	280
284	CONNECT 40000	1	284
285	CONNECT 40000/ARQ	14	284
286	CONNECT 40000/V90	1	284
287	CONNECT 40000/ARQ/V90	14	284
288	CONNECT 33333/V90	1	180
289	CONNECT 33333/ARQ/V90	14	180
290	CONNECT 37333/V90	1	184
291	CONNECT 37333/ARQ/V90	14	184
292	CONNECT 41333/V90	1	188
293	CONNECT 41333/ARQ/V90	14	188
294	CONNECT 42666/V90	1	192
295	CONNECT 42666/ARQ/V90	14	192
296	CONNECT 44000/V90	1	196
297	CONNECT 44000/ARQ/V90	14	196
298	CONNECT 45333/V90	1	200
299	CONNECT 45333/ARQ/V90	14	200

Extended Result code		Basic (x0)	non-ARQ (&A0)
300	CONNECT 46666/V90	1	204
301	CONNECT 46666/ARQ/V90	14	204
302	CONNECT 48000/V90	1	208
303	CONNECT 48000/ARQ/V90	14	208
304	CONNECT 49333/V90	1	212
305	CONNECT 49333/ARQ/V90	14	212
306	CONNECT 50666/V90	1	216
307	CONNECT 50666/ARQ/V90	14	216
308	CONNECT 52000/V90	1	220
309	CONNECT 52000/ARQ/V90	14	220
310	CONNECT 53333/V90	1	224
312	CONNECT 54666/V90	1	228
313	CONNECT 54666/ARQ/V90	14	228
314	CONNECT 56000/V90	1	232
315	CONNECT 56000/ARQ/V90	14	232

V.90 Status Values for ATI11

Status values are displayed on the **ATI11** screen. The following table provides a list of new status values for V.90 support:

Value	Description
x2v_pcmNotOperational	The modem is not upgraded, enabled, or licensed to permit the operation of the x2 and/or V.90 firmware that was installed on the modem.
x2operational	x2 made the current or latest connection.
v8disabledLocal	The local modem can make neither x2 nor V.90 connections because V.8 is disabled. Both x2 and V.90 require V.8 to make connections.
x2disabledLocal	The local modem can make no x2 connections because x2 is disabled. V.90, if present, is enabled.
baud3200disabledLocal	An attempt to make an x2 connection failed because the 3200 baud symbol rate is disabled in the local modem.

Value	Description
speedLimitedLocal	Either DTE speed or an &N command is limiting the link speed of the local modem to a range of speeds that permit neither x2 nor V.90 operation.
v8notDetectedFromRemote	The remote modem did not detect V.8, which is required for both x2 and V.90 connections.
x2notDetectedFromRemote	The remote modem did not detect x2, and V.90, if present, is disabled in the local modem.
incompatibleX2versions	An attempt to make an x2 connections failed because no version of x2 compatible between both modems is supported.
incompatibleX2modes	An attempt to make an x2 connection failed because the modes available to the modems are incompatible. Either one modem must be a server and the other a client, or both must be symmetric.
baud3200DisabledRemote	An attempt to make an x2 connection failed because the 3200 baud symbol rate is disabled in the remote modem.
excessiveHFAttenuation	An attempt to make an x2 or V.90 connection failed because the PSTN channel between the modems has too much high frequency attentuation. Some portion of the channeling is analog for x2 symmetric and V.90 all-digital modes.
channelNoSymbolRate	An attempt to make an x2 or V.90 connection failed because the PSTN channel between the modems does not support symbol rates required by either x2 (3200) or V.90 (3000, 3200, 3429).
exitBeforeConnect	An attempt to make an x2 or V.90 connection failed because one modem retrained to another modulation before the connection could be established. This is generally a problem with the PSTN.
v_pcmOperational	V.90 made the current or latest connection.
x2v_pcmOperational	No connection has been made since the modem was last reset, but both x2 and V.90 connections are possible with appropriate modems.
v_pcmDosabledLocal	No V.90 can be made because V.90 is disabled in the local modem. Since x2 is enabled in the local modem, an x2 connection can be made with appropriate modems.

Value	Description
x2v_pcmDisabledLocal	Neither x2 nor V.90 connections can be made because both x2 and V.90 are disabled in the local modem.
v_pcmSymbolRatesDisabledLocal	An attempt to make a V.90 connection failed because all V.90 symbol rates (3000, 3200, and 3429) are disabled in the local modem.
v_pcmNotDetectedFromRemote	The remote modem did not detect V.90, and x2 is disabled in the local modem.
x2v_pcmNotDetectedFromRemote	The remote modem detected neither x2 nor V.90.
incompatiblev_pcmVersions	An attempt to make a V.90 connection failed because neither modem supports a compatible implementation of V.90.
incompatiblev_pcmModea	An attempt to make a V.90 connection failed because the modems are using incompatible modes.Either one modem must be in V.90 mode with a digital interface and the other in V.90 mode with an analog interface, or both must be all-digital.
v_pcmIncompatibleSymbolRates	An attempt to make a V.90 connection failed because no compatible V.90 symbol rate (3000, 3200, and 3429) was supported by both modems.

How HiPer DSP with V.90 Interacts with Total Control Manager and the Network Management Card

The following information describes at a high level the changes implemented to Total Control Manager/SNMP and the Network Management Card (NMC) to support the implementation of V.90 modulation in HiPer DSPs.

Management Information Base Objects

Management Information Base (MIB) objects have been implemented to support HiPer DSP with V.90 modulation. These objects allow you to enable and disable V.90 modulation, set transmit power levels, apply transmit power to the CODEC or Server, and display modulation type:

MIB object	Description	AT Cmd
mdmScV90Digital	Enable=0/Disable=1 V.90 (D90)	s81.5
mdmScTXPwrLvl	Transmit power level	s82

MIB object	Description	AT Cmd
mdmScTxPwrLvlApplied	Transmit power level is to be applied to the CODEC (0) or Server (1)	s81.0
mdmCsInitModlationType	Displays modulation at connect time	ATI11

Enumeration Value for Management Information Base Objects

The following table displays the HiPer DSP enumeration value for digital v.90 modulation:

Description	HiPer DSP Enum Value	NMC Enum Value
V.90 digital (D90)	33	v90Digital(34)

For more information about MIB objects and enumerated values, refer to Network Management Card Parameter Reference Guide.

Programmed Settings

In Total Control Manager, the Programmed Settings option for HiPer DSP contains one V.90 configurable object under the configuration group name x2: V.90 Digital.

These objects function in either of two enumerations: Enable (default) or Disable. The objects are available at the channel level and are saved or restored in Save/Restore Configuration.

The following settings control the V.90 forward (&N and &U) and back link rates (S74 and S75):

MIB object	Description	Cmd
mdmScLinkRateSelect	Forward (High-speed) Channel Max Speed	(&N)
mdmScLinkRateAmpU	Forward (High-speed) Channel Min Speed	(&U)
mdmScLowerSpeedMin	Back (Low-speed) Channel Min Speed	(S74)
mdmScLowerSpeedMax	Back (Low-speed) Channel Max Speed	(S75)

Performance Monitor

The ATI11 screen displays the following status values.

Enumeration Text	Enumeration Value	Renamed/New
X2v_90NotOperational	1	renamed
X2operational	2	renamed
V8disabledLocal	3	renamed
X2disabledLocal	4	renamed
Baud3200disabledLocal	5	renamed
SpeedLimitLocal	6	renamed
V8notDetectedFromRemote	7	renamed
X2notDetectedFromRemote	8	renamed
IncompatibleX2Modes	10	renamed
Baud3200DisabledRemote	11	new
ExcessiveHFAttenuation	12	renamed
ChannelNoSymbolRate	13	renamed
ExitBeforeX2Connect	14	renamed
V_90Operational	15	new
X2v_90Operational	16	new
V_90DisabledLocal	17	new
X2v_90DisabledLocal	18	new
V_90SymbolRatesDsiabledLocal	19	new
V_90NotDetectedFromRemote	20	new
X2v_90NotDetectedFromRemote	21	new
IncompatibleV_90Versions	22	new
IncompatibleV_90Modes	23	new
V_90IncompatibleSymbolRates	24	new

Added Cost Features

V.90 is not a separate feature and therefore does not have a Feature Enable key.

17 CONFIGURING ISDN

This chapter contains:

- Selecting frame size
- Selecting window size
- Relationships between frames and windows
- Viewing current frame and window size settings
- How to get the best possible connection
- Setting the originate call type

Overview

HiPer DSP only supports X.75 frame and window size configuration.

Frame Size

Frame size is the number of data bytes sent in an X.75 frame.

Window Size

Window size is the number of frames sent before an acknowledge (ACK) is received.

An important part of system performance is window size. The larger the window, the more frames the system can transfer without an acknowledgment. However, the more frames the system transfers without an acknowledgment, the more the receiver is required to allocate additional buffer space to handle the incoming transmissions.

Selecting Frame and Window Size

Use the following AT commands to select frame and window size:

To set	Command	Where n equals a value	Default size
Frame size	AT*X0=n	Between 1 and 2048	2048 bytes
Window size	AT*X1=n	Between 2 and 7	7

Relationships Between Frames and Windows

Although you can set the frame size on HiPer DSP up to 2048, use the chart below to determine the actual values allowed by HiPer DSP.

If you set the frame size to	Then the modem allows this window size
2048	2
1024	4
512	7

Viewing Current Frame and Window Size Settings

Use the following command to view current frame (*X0) and window (*X1) size settings.

ATI4

The Best Possible Connection

Every time a call enters the chassis, HiPer DSP goes through a link negotiation process (called "handshaking") with the remote device.

The way HiPer DSP handles outgoing and incoming calls depends on the call type setting you chose. You can set HiPer DSP to handle incoming calls seven different ways:

- The best possible connection (Universal Connect)
- Clear channel synchronous
- V.120 only
- V.110 only
- X.75 only
- Analog modem/fax emulation
- Synchronous PPP

Universal Connect Call Flow

HiPer DSP tries a number of calls and detection processes.

Modes	Commands	Parameters (and Protocols)
Originate Mode HDLC Protocol Selection	AT*U1=n (This is the first attempt)	n=0 (None) n=1 (V.120) n=2 (X.75) n=3 (Async-to-Sync PPP)
Originate Mode Non-HDLC Protocol Selection	AT*U2=n (second attempt)	n=0 (None) n=1 (V.110)
Originate Mode Analog Modem/Fax Selection	AT*U3=n (third attempt)	n=0 (None) n=1 (Analog Modem/Fax)

When you set HiPer DSP to Universal Connect and make or receive a call, HiPer DSP attempts a V.110 connection only if you set ***S67.0=1****. In Universal Connect answer mode, when V.110 is enabled, HiPer DSP makes the V.110 attempt third in the Universal Connect sequence.*

Answering and Originating Calls

Use the following table to set the answer and originate call type.

To set the answer call type to	Command
Autodetect (not supported for outgoing calls)	AT *V2=0
V.120 rate adaption only	AT *V2=1
V.110 rate adaption only	AT *V2=2
Modem or fax only	AT *V2=3
Clear channel synchronous only	AT *V2=4
Asynchronous to synchronous PPP only	AT *V2=5
X.75 connection only	AT *V2=6

*If you set the call to a specific type (*V2=1-6) and the desired connection cannot be made, HiPer DSP does not negotiate for other types of connections.*

Setting the Originate Call Type

You can set the originate call type for each B-channel. These commands are only valid when autodetect is used (*V2=0).

The HiPer DSP saves the state of these new commands in Flash memory

Originating HDLC 64 kbps and 56 kbps Protocols

Use the following settings to control the originating HDLC 64 kbps and 56 kbps protocols:

To set the originate call type to	Command
None	*U1=0
V.120	*U1=1
X.75	*U1=2
PPP	*U1=3

Originating Non-HDLC Protocols

Use the following settings to control the originating non-HDLC 64 protocols:

To set the originate call type to	Command
None	*U2=0
V.110	*U2=1

Originating Analog Modem/Fax Mode

Use the following settings to control the originating analog modem or fax mode:

To set the originate call type to	Command
None	*U3=0
Analog modem/fax	*U3=1

18 Configuring Non-Facility Associated Signaling with D-Channel Backup

This chapter contains:

- Overview of Non-Facility Associated Signaling (NFAS)
- How to configure HiPer DSP for use with NFAS
- How to troubleshoot a HiPer DSP configured for NFAS

Execute all commands in this chapter from the span level (span1>).

Introduction

To increase the number of B-channels when using multiple PRI lines with the Total Control Hub, you can configure the HiPer DSP for NFAS with D-channel backup capability.

A T1/PRI span normally consists of 23 B-channels and one D-channel. The D-channel transmits signaling information pertaining to call setup and maintenance on the associated B-channels.

NFAS allows a single D-channel to establish, control, and maintain B-channels for multiple spans. The rationale behind NFAS is that telephone companies charge much more for a span with a D-channel. By minimizing the number of D-channels, you reduce your costs significantly.

Also, by using NFAS, you can increase signalling reliability. You can designate a backup D-channel. This means that each NFAS group could have two D-channels, one active and one standby.

HiPer DSP does not support NFAS for E1.

Configuring Non-Facility Associated Signaling with D-Channel Backup: Overview

Step 1: Determine the number and type of spans, which you want in each NFAS group.

Step 2: Request the telephone company to provide a compatible switch, and request telco to issue the number and type of spans, which you chose in step one.

Step 3: Configure the HiPer DSP for NFAS.

Step 4: View the new configuration.

Step 5: Test the configuration.

To select templates, you must use TCM. For more information about selecting templates do the following: From the TCM help search, enter "templates", and a templates help window appears.

Step One: Selecting the Spans

Determine the number and type of spans, which you want in each NFAS group.

An NFAS group is the number of spans supported by a single D-channel, which may include an optional backup D-channel.

Consider the following configuration limitations and requirements before continuing with step two:

- No more than 14 spans per group (due to maximum number of HiPer DSPs in a chassis being 14)
- At least two spans per group with no backup D-channel
- At least three spans per group with backup D-channel
- One and only one primary D-channel per group
- One optional backup D-channel per group
- No interoperabilitiy with Dual T1/PRI NAC
- NMC card present in the chassis and operating normally (i.e. Chassis awareness information available)
- NFAS is supported with any gateway card (i.e. NetServer, HiPer ARC, Edgeserver)

Step Two: Request Switch Connection and Spans

Request Telco to provide a compatible switch, and request telco to issue the number and type of spans that you chose in step one.

Telco will assign the fixed interface IDs for each of those spans. You will later use those interface IDs to configure the HiPer DSP.

Telco must assign interface IDs from 0-13. HiPer DSP does not support any other interface ID numbers.

The following is a list of switches that support NFAS:

- 4ESS (T1) (AT&T)
- 5ESS (T1) (AT&T)
- DMS-100 Custom (T1) (Northern Telecom)
- NET5/CTR-4 (European ISDN) (E1)
- VN4 (France) (E1)
- NI-2
- INS1500 (Japan)
- TS014 (Australia)

You can only configure HiPer DSP for NFAS from the span command prompt (i.e. `span>`*).*

Step Three: Configure the HiPer DSP for NFAS

1. Display the current NFAS configuration by entering the following command:

   ```
   span1> di nfas
   ```

   If the card is configured, the `NFAS All Groups Info Table` appears. To configure or reconfigure the card, continue with these steps.

2. View the compatible switch types and commands for setting each switch by entering the following command:

   ```
   span1> set swty
   ```

The following list of switch types and commands appears:

```
>
> chdev span
span1> set swty

Usage: set Set Switch Type ARGUMENT
        Where valid ARGUMENT settings are:
                4ess     - 4ESS switch type (T1) (AT&T)
                5ess     - 5ESS switch type (T1) (AT&T)
                dms100   - DMS-100 Custom switch type (T1)
                           (Northern Telecom)
                ictr4    - NET5/CTR-4 switch type
                           ( European ISDN ) (E1)
                vn4      - VN4 switch type ( France ) (E1)
                ni2      - NI-2 switch type
                ins1500  - INS1500 switch type ( Japan )
                ts014    - TS014 switch type ( Australia )

span1>
```

3 Set the switch type by entering the following command:

`span1> set switch [switch type]`

If the configuration is successful, `Configuration Request Successful` appears. Also to be sure you set the switch type, you may type **`span1> dis swty`** to display the current switch type setting.

4 Reboot the card by resetting the card manually or entering the following from the root command level:

`span1> reboot`

You must reboot the card to save the switch-type setting.

5 Determine if the card is configured for NFAS by typing the following:

`span1> di nfas`

If NFAS is configured, the following appears:

```
>
> chdev span
span1> di  nfas

           NFAS All Groups Info Table
```

```
SlotId  GroupId  IntfId  SpanType  D-Channel  SigGrp
 1-own     0        0     PRIMARY    IS         NFAS
 2         0        0     BACKUP      STBY      NFAS
 3         0        0     NONE       OOS       NFAS
 4         0        0     NONE       OOS       NFAS
 5         1        1     PRIMARY    IS        NFAS
 6         1        1     BACKUP     STBY      NFAS
 7         1        1     NONE       OOS       NFAS
 8         1        1     NONE       OOS       NFAS
span1>
```

Below is a list of definitions for the above NFAS display:

Syntax	Definitions
Slot Id	The card's chassis slot
Group Id	The card's NFAS group ID
IntfId	The line interface ID, which Telco assigns
SpanType	Either primary, backup, or no D-channel on the span
D-Channel	The following are descriptions of card's D-channel: ■ IS: In Service ■ STBY: STand BY ■ OOS: Out Of Service ■ WAIT: Exactly as it sounds; wait ■ MB: Maintainence Busy
SigGrp	The type of signal group

6 Using the screen display and definitions from the previous substep, configure the span group ID, the interface type, and the interface ID.

Only interface IDs 0-13 are compatible with HiPer DSP. Be sure the telephone company issues interface IDs from 0-13.

Below is an example of possible NFAS configuration syntax.

```
>
> chdev span
span1> set nfas 2 primary 0

  Configuration Request Successful.
```

If you correctly configured the span to have a primary D-channel, the LPBK/D-ALM LED, on the face of the HiPer DSP, will be solid green. If you correctly configured the span to have a backup D-channel, the LPBK/D-ALM LED will be blinking green. Also, to be sure you configured the card correctly, refer to step 5 on the previous page.

7 Confirm your configuration by entering the following syntax:

```
span1> di nfas
```

An NFAS groups table appears.

When you are done configuring HiPer DSP, save the configuration of the span and the modems:

8 Save the span configuration by entering the following command.

```
span1> cmd svspcfg
```

Step Four: Test the Non-Facility Associated Signaling Configuration

Use the following to test your configuration:

Test the Backup D-Channel

Use the following steps to test the backup D-channel:

1 Connect to the card through the console port.

2 Unplug your span from the card connected to the primary D-channel.

3 Enter **`span1> di nfas`** to see the status of the cards. The `NFAS All Groups Info Table` appears.

4 Look at the `D-Channel` column, and note the status of the card with the backup D-channel. It should show `WAIT, IS,` or `OOS`.

- `WAIT` appears when the card senses the primary D-channel is down.
- `IS` appears when the card becomes In Service. The card will only go In Service when it is connected to the same switch as the card with the primary D-channel. (Also, the LPBK/D-ALM LED, on the face of the card, will stop blinking and become solid green.)

- `OOS` appears when the card cannot connect to the switch, to which the primary D-channel was connected. (Also, the LPBK/D-ALM LED, on the face of the card, will stop blinking and become red.)

The backup D-channel is working if it recognizes that the span is disconnected. It does that by displaying `WAIT, IS,` or `OOS`.

Test the Modems

Because the modems receive calls in a sequential order, your initial setup will not provide an accurate modem test. You will need to test the modems on all the cards in your NFAS group. To test the modems, use the following steps:

1. Dial the line number of your NFAS group. The first modem LED on the *first* card should become green.
2. Disconnect the call. The modem LED should become red.
3. Connect to the first card's console port, in the NFAS group you are testing. Enter the following from the `span` command prompt to deactivate the all the modems on the first card:

   ```
   span1> cmd soos hard
   ```

   Your syntax should appear as the following:

   ```
   span1>
   cmd soos hard
     Command Request Successful.
   ```

4. Be sure you have deactivated those modems by entering the following:

   ```
   span1> dis atp
   ```

   A table appears, which states the HiPer DSP modem status. In the status column, each modem should display `OOS`, which means the modems are Out Of Service.

5. Dial the line number of your NFAS group. The first modem LED on the *second* card should turn green.
6. Repeat that process until you have connected to the cards in your NFAS group and tested the D-channel with each card.
7. After you test the cards, you will need to reactivate the modems. Connect to the console port of each card, which contains the modems you

deactivated, and type the following from the span command line prompt:

```
span1> cmd sins
```

Your syntax should appear as the following:

```
span1>
cmd sins
  Command Request Successful.
```

8 Be sure you reactivated the modems by entering the following command while connected to each card:

```
span1> dis atp
```

Again a table appears, and in the status column you should see IS, which means the modems are In Service.

Non-Facility Associated Signaling Trouble Clearing

If you have problems configuring an NFAS group or your NFAS group is not functioning properly, check the following:

- Be sure the card is configured properly. Specifically check the switch type setting. Most problems occur because the wrong switch type is set. Enter **span1> dis swty** to display the switch type setting. If the switch type is not set correctly, refer to the instructions for configuring NFAS at the beginning of this section.
- Check the signal setting by entering **span1> dis sig**. If MESSAGE ORIENTED appears, your signal is configured for PRI. If it is not configured for PRI, refer to chapter five: Configuring PRI.
- Check the interface ID on the card to be sure it is the same as the interface ID on the switch side. Enter **span1> dis nfas** to check the interface ID setting. If the interface ID is wrong, refer to the instructions for configuring NFAS at the beginning of this section.
- Problems may result from the telco side. If your settings are correct, call telco to be sure they have connected your line to the correct switch type, and also be sure they have given you the correct interface ID.

19 Console Interface Span Commands

This chapter contains:

- Span command basics
- Span card commands
- Span line commands
- Timeslot commands

Overview

HiPer DSP adheres to RFC (Request for Comments) 1406, Definitions of Managed Objects for the DS1 and E1 Interface Types, that defines MIB objects for managing T1 and E1 DS1 Interfaces.

RFC 1406 is available free on the Internet at the following URL:

http://www.rfc-editor.org/rfc.html

Span Command Basics

Switching Between Devices

Use the following commands to switch between span cards, span lines, and timeslots:

To Configure	Command
Span card	chdev spncard
Span line	chdev span
Timeslot	chtslot or chdev tslot

Span Commands

You can configure the entire span card, the span line, individual modems or individual timeslots.

See Chapter 3, Console Interface Basics, for information about span commands available at each level.

Span Card Commands

Span Card Command Basics

All commands in this section must be performed at the SPAN> level. To switch to the span level (SPAN>) use the chdev command:

```
>chdev span
span>
```

Span Card Commands

Span card commands globally configure the DS1 interface in a HiPer DSP module.

To do this	Command
Change device type/command levels.	chdev
Configure specific parameters within the span card.	set
Execute commands to the span line. Some commands have the option of executing immediately or after any call(s) on the span have been completed.	cmd
Exit the command line interface.	quit
Obtain general or positional help for a command level or specific command.	help
Show the settings for various span line parameters.	display

Executing Specified Memory Configuration for a Span Card

Use the table below to restore or save configurations.

To change span card configurations by	Command
Restoring configurations from factory defaults	cmd rdefault
Restoring configurations from Flash memory	cmd rsspcfg
Saving configurations to Flash memory	cmd svspcfg

Setting Span Card Level Settings and Statistics

Use the following table to display span card level settings and statistics:

Display parameters	Command
Phone number and call type (A for Analog, D for Digital)	display calltype
Modem routing method	display mdmrmeth

These display commands apply to all spans on HiPer DSP.

Use the table below to set span card level settings and statistics.

To set	Command
Phone number and call type	set calltype <phone number> <A | D> (A for Analog, D for Digital)
Modem routing method	set mdmrmeth

Span Line Commands

Span Line Command Basics

Span line commands control how a specific span in HiPer DSP module performs. In addition to all commands on the span card level, you can use these additional commands or the span line level.

Switching to the Span Line Level

All commands in this section must be performed at the SPAN1> level. To switch to SPAN 1> use the chdev command:

```
>chdev span
span1>
```

To do this	Command
Change device type or command levels.	chdev
Clear specific parameters and settings from the span line.	clear
Execute commands to the span line. Some commands have the option of executing immediately or after any call(s) on the span have been completed.	cmd
Show the settings for various span line parameters.	display

To do this	Command
Obtain general or positional help for a command level or specific command.	help
Exit the command line interface.	quit
Configure specific parameters within the span line.	set

HiPer DSP has only one span line in this release.

Setting Analog Calls Blocked Error Code

Use this command: **`set ancbec <value>`**

Value: 0 to 127

Setting Call Type Blocking

This function stops specified types of calls from entering through the DS1 interface.

To block	Command
All call types	set blcaltyp all
Analog call types	set blcaltyp analog
Digital call types	set blcaltyp digital
No call types	set blcaltyp none

These commands apply to T1- and E1-PRI only.

Setting the DS1 Signal Call Type

Call type configures the type of telephone company signal expected from the DS1 interface. This is used to override a dial-in PRI analog call and treat it as a digital call.

If the phone number is 5100 and is a digital call, the call comes in with a dialed number of 5100 and is signaled with BC (analog), the phone number match is found and the call type is overridden to digital.

To set	Command
Phone number and call type	set calltype <phone number without spaces > <A | D> (A for Analog, D for Digital)
Modem routing method	set mdmrmeth

Setting the Channel Block Error Level

Use this command: **`set chanblck <value>`**

Value: 0 to 127

Setting the CHT1 Profile

Use the table below to set the CHT1 profile used by the DS1 interface.

To set this CHT1 profile	Command
E&M Type II FGB	set cprofile fgbt2
E&M Type II FGD	set cprofile fgdt2
E&M Type II Generic	set cprofile genert2
Loop Start	set cprofile lpstart
Ground Start	set cprofile gndstart

For a list of each feature group profile, see Appendix K, T1 Feature Group Defaults.

Setting the Configured Receiver Gain

Use the table below to set the configured receiver gain for the CHT1 DS1 interface.

To set the configured receiver gain to	Command
Configurable Receiver Gain not supported	set crgain crgnsupp
12 db Receiver Gain	set crgain 12db
26 db Receiver Gain	set crgain 26db
36 db Receiver Gain	set crgain 36db
43 db Receiver Gain	set crgain 43db

Setting the Dial-in Address Acknowledgment Wink

Use the table below to set the acknowledgment wink.

To do this	Command
Enable acknowledgment wink after the dial-in address	set daackwnk enable
Disable acknowledgment wink after the dial-in address	set daackwnk disable

Setting the Digital Call Blocking Error Code

Use the following command: **`set dcbec <value>`**

Value: 0 to 127

Setting the Dial-in or Dial-out Trunk Start Signal Type

Use the table below to set the trunk start signal type.

To set trunk start signal type for	Command
Wink signal	set diotrst wink
Immediate signal	set diotrst immediat
Dial tone signal	set diotrst dialtone

Configuring the Dialed Number Identification Enable Type

Use the table below to configure DNIS and ANI.

To configure the DNIS call set up enable type for	Command
No address sent	set dnisena noaddr
DNIS address sent	set dnisena dnisaddr
ANI and DNIS address sent	set dnisena daniaddr
ANI address sent	set dnisena aniaddr

Configuring the Number of Dial-out Next Slots

Use the following command: **`set dntslot <value>`**

Value: 1 to 24

This command is used for CHT1 only.

Setting the Dial-out Address Delay

Use the following command: **`set doardrdly <value>`**

Value: 70 to 3000 (milliseconds)

Setting the Dial-out Select Direction

Use the table below to set the dial-out select direction.

To set the (dial-out) direction to	Command
Down	set dseldir down
Up	set dseldir up

This command is used for CHT1 only.

Setting the Dial-in/Dial-out Trunk Type

Use the table below to set the dial-in out trunk type.

To set the (dial-in/dial-out) trunk type to	Command
E&M type II	set dtrnktyp emtype2
Loop start	set dtrnktyp loopstrt
Ground start	set dtrnktyp grndstrt

Setting the Facilities Data Link

Command: set fdl <link_type>

Setting Idlebyte (in Hexadecimal)

Use the following command to set idlebyte (in hexadecimal) when no call is in progress:

```
set idlebyte <hexadecimal value>
```

Hexadecimal values: 0 to 0xFF

Setting Jitter Attenuation

Use the following table to set jitter attenuation.

To set jitter attenuation to	Command
Receiver jitter [attenJitterOnRcvr]	set jittaten rxr
Transmitter jitter [attenJitterOnTxmtr]	set jittaten txr
Setting the DSX1 line coding method	

Setting Line Coding

Use the following table to set the line coding method.

To set the DSX1 line coding method to	Command
Binary Eight Zero Code Suppression	set lcoding b8zs
High Density Bipolar 3 Zeros	set lcoding hdb3
Alternate Mark Inversion	set lcoding ami

This table refers to RFC 1406. Consult RFC 1406 for more information.

Setting DSX1 Line Type

Use the following table to set the line type.

To set DS1 line type to	Command
Extended SuperFrame DS1	set ltype esf
AT&T D4 format DS1	set ltype d4
CCITT Recommendation G.704 (Table 4a)	set ltype e1
CCITT Recommendation G.704 (Table 4b)	set ltype crce1
G.704 (Table 4a) with TS16 multiframing enabled	set ltype mfe1
G.704 (Table 4b) with TS16 multiframing enabled	set ltype crcmfe1

This table refers to the line type tables found in RFC 1406. Consult RFC 1406 for more information.

Setting the Modem Routing Method

Use the following table to set the Modem Routing Method for the span. You can set HiPer DSP to route calls based on your needs.

To set the modem routing method to	Command
Round Robin [roundRobin]	set mdmrmeth rndrobin
First Available [firstAvailable]	set mdmrmeth 1stavail
Fixed Assignment [fixedAssignment]	set mdmrmeth fixeda

Configuring the DS1 Interface

Use the following table to configure the DS1 interface for the type of Network Interface Card (NIC) used.

To configure the NIC being used is	Command
Long-haul	set nicfgtyp long
Short-haul	set nicfgtyp short

Setting the No IGWS Available Error Code

Use the following command: **`set noigwsav <value>`**

Values: 0 to 127

Setting the Number of Dual Tone Multi-Frequency Tones

Use the following command: **`set numdtmft <value>`**

Values: 0 to 127

Default: 4

Setting the Remotely Initiated Loopback Parameter

Use the following table to set the loopback parameter.

To set parameter to	Command
Ignore remote loopback requests	set rilpback ignore
Respond to remote loopback requests	set rilpback respond

Setting the Signal Level Short-Haul Distance

Sets the signal level used, based on the Short-Haul Cable Distance.

To set signal level used to	Command
0 to 133 feet	set shauldis 0to133
133 to 266 feet	set shauldis 133to266
266 to 399 feet	set shauldis 266to399
399 to 533 feet	set shauldis 399to533
533 to 655 feet	set shauldis 533to655

Setting the DSx1 signal mode

Use the following table to set the signal mode.

To set the DSx1 signal mode to	Command
Robbed-bit (used for T1)	set sigmode robbit
Message-oriented (used for PRI)	set sigmode msgorien

This table refers to RFC 1406. Consult RFC 1406 for more information. Also, if you change the signaling mode of HiPer DSP, save the settings and reboot HiPer DSP for this change to take effect. Either manually reboot the card by pulling and reinserting it, or from the root directory of the command line interface, enter ***reboot****.*

Setting the Primary Rate Interface Switch Type

Use the following table to set the PRI switch type.

To set the PRI switch type to	Command
4ESS (T1) (AT&T)	set swtype 4ess
5ESS (T1) (AT&T)	set swtype 5ess
DMS 100 Custom (T1) (Northern Telecom)	set swtype dms100
NET5/CTR 4 (European ISDN) (E1)	
VN4 (France)	set swtype vn4
NI 2	set swtype ni2
INS1500 (Japan)	set swtype ins1500
TS014 (Australia)	set swtype ts014

Setting the DSX1 Tone Type

Use the following table to set the DSx1 Tone Type for CHT1 connections.

To set the DSX1 tone type to	Command
CHT1 MF	set tonetype mftone
CHT1 DTMF	set tonetype dtmftone

Setting Transmit Clock Source

Use the following table to set the transmit clock source.

To set transmit clock source for	Command
Loop timing	set txclksrc loopt
Local timing	set txclksrc localt

Refer to RFC 1406 for more information about this table.

Setting the Transmit Line Build Out Signaling

Use the following table to configure the long-haul NIC transmit line build out signaling.

To set the transmit line build out signaling to	Command
0.0 dB xmit [dB0]	set txlibo 0.0db
-7.5 dB xmit [negdB7]	set txlibo -7.5db
-15.0 dB xmit [negdB15]	set txlibo -15.0db
-22.5 dB xmit [negdB22]	set txlibo -22.5db

Timeslot Commands

Using Timeslot Commands

In addition to all commands on the span card level, you can use these additional commands or the span line level.

Switching to the Timeslot-Level

All commands in this section must be performed at the span1\timeslot> level. To switch to span1\timeslot> use the chdev command:

```
>chdev tslot
span1\timeslot>
```

Timeslot Commands

Timeslot commands control how a specific timeslot in HiPer DSP module performs.

To do this	Command
Change device type or command levels	chdev
Change to a specific timeslot	chtslot

Remove specific parameters and settings from the timeslot or span line	clear
Execute commands to the timeslot or span line.	cmd
Show the settings for various timeslot and span line parameters.	display

Remove specific parameters and settings from the timeslot or span line	clear
Obtain general or positional help for a command level or specific command	help
Exit the command line interface	quit
Configure specific parameters within the timeslot or span line.	set

Change Timeslot Command

Use the following table to navigate through the timeslots in an HiPer DSP module.

Provides navigation through	Command
1 through 24 for T1-PRI and CHT1 modules, or 0-31 for E1-PRI modules	chtslot <value>

Clear Commands

Use the following table to clear any previous settings from these parameters.

To clear parameter settings for	Command
Call type	clear calltype <phone number with no spaces>
Facilities Data Link information for a span line	clear fdl

Immediately Disconnect All Calls on a Span Line

Use the following command:

```
cmd discall
```

Immediately Force a Receiver Reframe

Use the following command:

```
cmd freframe
```

Configuring for a Loopback Test

Use the following table to configure for a loopback test across the DS1 interface.

To Configure a loopback test for a	Command
Span No Loop test	cmd loconfig noloop
Span Pay Load Loop test	cmd loconfig payload
Span Line Loop test	cmd loconfig lineloop

Refer to RFC 1406 for more information about this table.

Immediately Disconnect Any Call on a Specific Timeslot

Use the following command:

```
cmd onhook
```

Restoring Span Card Configurations

Use the following command: **`cmd rdefault`**

Refer to RFC 1406 for more information about this table. This command restores span card configuration to factory defaults.

Restoring Span Card Configurations from Flash

Use the following command:

```
cmd rsspcfg
```

Sending out a Specific Code to the Trunk Line

Use the following table to send a specific code to the trunk line.

To send out	Command
Looped or normal data	cmd sendcode nocode
A request for a line loopback	cmd sendcode linecode
A loopback termination request	cmd sendcode reset
A QRS (Quasi Random Signal) test pattern	cmd sendcode qrs

Refer to RFC 1406 for more information about this table.

Placing a Span In Service

Use the following command: **`cmd sinserv`**

Refer to RFC 1406 for more information about this table. This command is used for CHT1 and T1-PRI only.

Taking a Span out of Service

Use the following table to take a span out of service.

To disconnect calls	Command
Immediately	cmd sooserv hard
When all call(s) are completed or dropped	cmd sooserv soft

Saving Span Card Configurations to Flash

Use the following command:

```
cmd svspcfg
```

Configuring Specific Timeslots to Ignore Any Incoming Calls

Use the following table to configure specific timeslots to ignore incoming calls.

To ignore incoming calls	Command
Immediately	cmd tcallig hard
When all call(s) are completed or dropped	cmd tcallig soft

These commands are compatible with CHT1 only.

Place a Specific Timeslot In Service

Use the following command: **`cmd tinserv`**

Takes a Specific Timeslot out of Service

Use the following table to take a specific timeslot out of service.

To take a timeslot out of service by	Command
Immediately	cmd tooserv hard
When all call(s) are completed or dropped	cmd tooserv soft

Near End Span Statistics

Use the following table to display the near end span statistics (errors coming into the DS1 interface).

To display statistics for	Command
Errors detected in the current 15 minutes of operation	display near current <interval value | a>
Errors detected in 15-minute intervals from 1-96. The <interval value> parameter is an optional parameter which allows you to choose a specific 15 minute time span. The interval values are stored in LIFO (Last In/First Out) order. Issuing the display interval a command displays all valid intervals within the past 24 hours.	display near interval<interval value | a>
Errors detected up to the last 24 hour increment since startup.	display near total <interval value | a>

Timeslot cmd Commands

cmd commands execute specified commands to a timeslot or span line. Some of these commands have an additional parameter that allows them to be executed immediately (hard), or upon the completion of any call(s) on the timeslot (soft).

Executes specific commands to	Command
Configure the loopback procedure	cmd loconfig
Disconnect all calls on the span line	cmd discall
Disconnect any call (hangs up) on a specific timeslot	cmd onhook
Force a receiver reframe	cmd freframe
Force a specific timeslot to ignore incoming calls	cmd tcallig
Perform a specific sendcode type through the span monitor to the T1 line	cmd sendcode
Place a span line back In Service	cmd sinserv
Place a specific timeslot back In Service	cmd tinserv
Restore span card configuration from factory defaults	cmd rdefault
Restore span card configuration from Flash memory	cmd rsspcfg
Save span card configuration to Flash memory	cmd svspcfg
Take a span line Out Of Service	cmd sooserv
Take a specific timeslot Out Of Service	cmd tooserv

Timeslot Set Commands

Use the following table to set configure specific span line parameters.

To set the span line parameters to	Command
Analog calls blocked error codes	set ancbec
Channel blocked error code	set chanblck
CHT1 user profile	set cprofile
Configured receiver gain	set crgain
Dial-in address ACK wink	set daackwnk
Dial-in out trunk start	set diotrst
Dial-in out trunk type	set dtrnktyp
Dial-out address delay	set doadrdly
Dial-out next timeslot	set dntslot
Dial-out select direction	set dseldir

To set the span line parameters to	Command
Digital calls blocked error code	set dcbec
DNIS enable	set dnisena
Facilities data link	set fdl
Idle byte	set idlebyte
Jitter attenuation	set jittaten
Line coding	set lcoding
Line type	set ltype
Modem routing method	set mdmrmeth
NIC configuration type	set nicfgtyp
No IGWS available error code	set noigwsav
Number of DTMF tones	set numdtmft
Phone number call type	set calltype
PRI switch type	set swtype
Remotely initiate loopback	set rilpback
Short-haul distance (for Short-Haul NIC)	set shauldis
Signal mode	set sigmode
Span line block call type	set blcaltyp
Timeslot assigned channel	set achannel
Timeslot block call type	set bcalltyp
Timeslot ID description	set iddescr
Timeslot service state	set sstate
Tone type	set tonetype
Transmit clock source	set txclksrc
Transmit line build out (for Long-Haul NIC)	set txlibo

Setting the Number of Assigned Channels for the Timeslot

Use the following table to set the number of assigned channels for the timeslot.

To set the number of assigned channels for the timeslot to	Command
1–24 for T1/PRI and CH T1	set achannel 1
0–31 for E1/PRI and E1/R2	set achannel 0

Call Type Blocking

Use the following table to block call types. Call type blocking stops specified types of calls entering through the timeslot.

To block call type	Command
No call type blocking enabled	set bcalltyp none
Block analog	set bcalltyp analog
Block digital	set bcalltyp digital
Block all	set bcalltyp all

Assigning a Name/Description to a Specific Timeslot (DS0)

Use the following command:

```
set iddescr <string>
```

Value: Any ASCII characters, up to a maximum of 40.

Anything typed after the command will become part of the ID description.

Setting the Service State of the Timeslot

Use the following table to set the service state of the timeslot.

To set service state of timeslot to	Command
Fractional unused CHT1 only.	set sstate frac
In Service.	set sstate is
Local Out Of Service T1-PRI and CHT1 only.	set sstate oos

Trouble Clearing the Span

This appendix contains:

- Trouble clearing the physical layer
- Trouble clearing call processing

Before you perform any trouble clearing, ensure that you have the correct version of HiPer DSP firmware.

To determine HiPer DSP software build versions, switch to the modem-level and view the ATI7 screen by entering the following:

```
>chdev mdm
mdm1>ati7
```

The ATI7 screen appears.

Trouble Clearing the Physical Layer

When trouble clearing the span, first determine if the physical layer is functioning properly.

Basic Physical Layer Trouble Clearing

The following are basic trouble clearing suggestions:

- View LEDs
- Check the physical state
- Check the line status

View LEDs

View the T1/E1 related LEDs to determine if the systems displays an alarm. If the following LEDs are displayed, the physical layer is functioning properly.

LED	Color	This has occured
RN/FL	green	Card has performed the Power On Self Test (POST)
CAR	green	Card has received good carrier
ALM	off	No alarm or remote frame alarm (rfa)

Check the Physical State

Switch to the span-level and check the Physical State object to determine the state of HiPer DSP Layer 1.

```
span1> display ph
[uds1StatE1PhysicalState]
   Span1 Physical State is:  F1 OPERATIONAL [psF1Operational]
```

The above display is `F1 OPERATIONAL` with no alarms. The physical layer is functioning properly.

Check the Line Status

Switch to the span-level and check the T1/E1 Line Status object (dsx1LineStatus) to determine what alarms (if any) are present and other line statuses.

If the "NO ALARM" field displays TRUE , the T1/E1 line is operational and the physical layer is functioning properly.

```
span1> display ls
[dsx1LineStatus]
   Span1 Line Status is:
      [dsx1NoAlarm] NO ALARM               = TRUE
      [dsx1RcvFarEndLOF] RCV FAR END LOF   = FALSE
      [dsx1XmtFarEndLOF] XMT FAR END LOF   = FALSE
      [dsx1RcvAIS] RCV AIS                 = FALSE
      [dsx1XmtAIS] XMT AIS                 = FALSE
      [dsx1LossOfFrame] OUT OF FRAME       = FALSE
      [dsx1LossOfSignal] LOSS OF SIGNAL    = FALSE
      [dsx1LoopbackState] LOOPBACK STATE   = FALSE
      [dsx1T16AIS] T16 AIS                 = FALSE
```

```
[dsx1RcvFarEndLOMF] RCV FAR END LOMF = FALSE
      [dsx1XmtFarEndLOMF] XMT FAR END LOMF = FALSE
      [dsx1RcvTestCode] RCV TEST CODE      = FALSE
      [dsx1OtherFailure] OTHER FAILURE     = FALSE
```

Checking the Received Error Statistics

Check the Received Error statistics (near, interval or total) on the span line. HiPer DSP displays the error statistics in real time.

If checking the current line status, verify that the error statistics are not growing.

```
span1> display near c
[dsx1CurrentIndex]
   Span1 Near Current Line Index is: 0
[dsx1CurrentESs]
   Span1 Near Current Errored Seconds is: 0
[dsx1CurrentSESs]
   Span1 Near Current Severly Errored Seconds is: 0
[dsx1CurrentSEFSs]
 Span1 Near Current Severly Errored Framing Seconds is: 0
[dsx1CurrentUASs]
   Span1 Near Current Unavailable or Failed Seconds is: 0
[dsx1CurrentCSSs]
   Span1 Near Current Controlled Slip Seconds is: 0
[dsx1CurrentPCVs]
   Span1 Near Current Path Coding Violations is: 0
[dsx1CurrentLESs]
   Span1 Near Current Line Errored Seconds is: 0
[dsx1CurrentBESs]
   Span1 Near Current Bursty Errored Seconds is: 0
[dsx1CurrentDMs]
   Span1 Near Current Degraded Minutes is: 0
[dsx1CurrentLCVs]
   Span1 Near Current Line Code Violations is: 0
Advanced Physical Layer Trouble Clearing
```

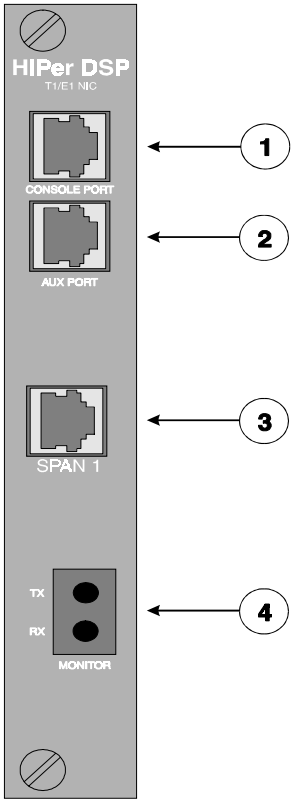
If Layer 1 is still down after performing basic physical layer trouble clearing, perform the following actions:

1. View the Line Status screen (display lstatus). If it displays "OUT OF FRAME", ensure the line type (dsx1LineType) is set correctly.
2. View the Error Statistics screen (display near c). If the error statistics are growing, ensure that the dsx1LineCoding is correct (For example, AMI instead of B8ZS).
3. View the Line Status screen (display lstatus). If the line status shows "LOSS OF SIGNAL", ensure the span line is connected correctly to the HiPer DSP NIC and the other T1/E1 equipment to which the HiPer DSP is connected.
4. Verify that the T1/E1 cable is the correct type and wired correctly. For more information, refer to the HiPer DSP T1/E1 NIC Getting Started Guide.
5. View the NIC screens (display nicfgtyp and display shauldis). Verify that the NIC interface is correct (Long or Short) and that the Line build out (long haul) is set correctly or the cable distance (short Haul) is correct.
6. View the Line Status screen (display lstatus). If the dsx1LineStatus shows "RCV FAR END LOF", then the remote end is not receiving the HiPer DSP's transmit signal or can not frame up on the signal.
7. View the Line Status screen (display lstatus). If the dsx1LineStatus shows "RCV AIS" then the remote end is sending an "all ones" or Blue alarm.
8. If possible, verify that the remote end has no alarms and the error statistics are not growing.

Trouble Clearing the T1/E1 Layer 1 with a Test Box

To trouble clear the HiPer DSP physical layer with a network analyzer/sniffer, refer to the following

Use these intrusively via the RJ-48C T1/E1 span interface or passively via the Bantam Monitor Jacks. Both the RJ-48C and the Bantam Monitor Jacks are pictured below.



Callout Number	Interface Description
1	**Console Port:** RJ-45 DTE port Connect to this port to access the HiPer DSP NAC's CLI. The port is configured for 9600 baud, 8 data bits, 1 stop bit, no parity.
2	**AUX Port:** RJ-45 DTE port Connect to this port to perform a software download (SDL) to the HiPer DSP NAC. The port is configured for 115,200 baud, 8 data bits, 1 stop bit, no parity.
3	**Span 1:** RJ-48C T1/E1 span line 1 interface Connect a T1 or E1 span line to this port.
4	**Monitor:** Bantam Monitoring jack Connect span line monitoring equipment to this port for span 1 diagnostics.

Ordering and Setting Up a Span Line

When you order a span line from the telephone company, make sure you know the answers to the following questions:

1. What is the line type (dsx1LineType)?
2. What is the line coding (dsx1LineCoding)?
3. What is the interface type (long or short haul)?
4. What will be the length of the T1/E1 cable from the HiPer DSP to the other T1/E1 device? Set the transmit line build out (long haul) or short haul cable distance (short haul) to match. If setting up for T1-PRI, the HiPer DSP must have the line coding set to B8ZS. Most telephone companies won't offer any other choice for line coding.

Trouble Clearing PRI Call Processing

If dial-in or dial-out PRI calls are not connecting, verify the following steps:

Step 1: Layer 1 is up

Step 2: The active dsx1SignalMode is correct

Step 3: The D-channel is up

Step 4: The PRI switch type

Step 5: B-Channels are available

Step One: Verify That Layer 1 Is Up

See Trouble Clearing the Physical Layer, earlier in this appendix.

Step Two: Verify That the Active dsx1SignalMode Is Correct

```
span1> display sigmode
```

The signal mode should be "message oriented" for PRI.

Step Three: Verify That the D-Channel Is Up

```
span1> chdev span
span1> display d-ch
```

The D-channel should be "up".

Step Four: Verify the PRI Switch Type

```
span1> display swtype
```

Verify that the proper switch type for the T1/E1 PRI interface is active and correct.

Step Five: Verify That B-Channels Are Available

```
span1> chdev span
span1> display ats
```

Look for idle B-channels to accept the call.

All the B-channels may be involved in calls or may have been taken Out of Service (OOS) by the telephone company.

If no B-Channels are available, calls cannot be made.

If the problem persists, call the T1 service provider/telephone company to be sure they did not take the B-channels OOS.

Trouble Clearing CHT1 Call Processing

If dial-in or dial-out CHT1 calls are not connecting, perform the following steps:

Step 1: Determine if Layer 1 is up

Step 2: Verify that the active dsx1SignalMode is correct

Step 3: Verify that the HiPer DSP has any available DS0s

Step 4: Verify ABCD signaling

Step 5: Verify that the CHT1 trunk type is correct

Step 6: Verify call blocking or Busy-out

Step One: Determine If Layer 1 Is Up

See Trouble Clearing the Physical Layer, earlier in this appendix.

Step Two: Verify That the Active dsx1SignalMode Is Correct

```
span1> display sigmode
```

The signal mode should be "robbed bit" for CHT1.

Step Three: Verify That the HiPer DSP Has Any Available DS0s

```
span1> display ats
```

Look for idle DS0s to accept the call.

All the DS0s could be involved in calls or may be busied out (OUT) either locally or by the telephone company.

If no DSOs are available, calls cannot be made.

Step Four: Verify That ABCD Signaling on the DS0s

```
span1> display atab
```

Verify that ABCD Signaling on the DS0s which should be idle are idle (0000)

ABCD Signaling should be "0000" for all idle DS0s.

Step Five: Verify That the CHT1 Trunk Type Is Correct

```
span1> display cc
```

Verify that the call profile is correct (cprofile) for the CHT1 service for the T1 line. The profile choices for uds1ChtProfile are as follows:

- Other (1)
- EAndMTypeIIFGB (2)
- eAndMTypeIIFGD (3)
- eAndMTypeIIGeneric (4)
- LoopStart (5)
- GroundStart (6)

uds1Cht1Profile	uds1CfgDialInOutTrunkSt	uds1CfgDialInOutTrunkSt	uds1CfgDialInAdr	uds1CfgDialInAdrAckWinkEn	ds1ToneType	ds1NumDtmfToens	uds1CfgDialOutAdrDly
EandMTypeIIFGB	eAndMTypeII	wink	dnis	disabled	mf	NA	70
eAndMTypeIIFGD	eAndMTypeII	wink	ani-dnis	enabled	mf	NA	70
eAndMTypeII Generic	eAndMTypeII	wink	dnis	disabled	dtmf	4	70
LoopStart	loopStart	dialTone	NA	NA	dtmf	NA	70
Ground Start	groundStart	dialTone	NA	NA	dtmf	NA	70

Step Six: Verify Call Blocking or Busy-Out

```
span1> display blcaltyp - span level block
span1> display chanblk - ds0 level block
```

Verify that span and DS0 level call blocking or Busy-out are not in effect on the span or DS0 effectively blocking the in-bound or out-bound call.

General Trouble Clearing Notes

Span Statistics

Use span statistics to help determine why inbound and outbound calls are not completing.

For example, if in-bound calls were being rejected because an available modem could not be obtained, the count for "modemNotAvailable" will be growing. See the following screen:

```
[modemNotAvailable]

   Span1 Modem Not Available Count is:        0
```

If the inbound setup contained an invalid Bearer Capability (example: H0 call) the "inCallInvalidBearCapa" would be growing for each call rejected due to this reason. See the following screen:

```
[inCallInvalidBearerCapa]

   Span1 Invalid Bearer Capability Count is:  0
```

See the usrds1.mib for more detailed description of these span statistic counters.

```
span1/tslot1> display spnstats
[dsx1TimeElapsed]
   Span1 Near Time Elapsed is:               4 seconds
[dsx1ValidIntervals]
   Span1 Near Valid Intervals is:            2
[dsx1LineStatus]
   Span1 Line Status is:
      [dsx1NoAlarm] NO ALARM               = TRUE
      [dsx1RcvFarEndLOF] RCV FAR END LOF   = FALSE
      [dsx1XmtFarEndLOF] XMT FAR END LOF   = FALSE
      [dsx1RcvAIS] RCV AIS                 = FALSE
      [dsx1XmtAIS] XMT AIS                 = FALSE
      [dsx1LossOfFrame] OUT OF FRAME       = FALSE
      [dsx1LossOfSignal] LOSS OF SIGNAL    = FALSE
      [dsx1LoopbackState] LOOPBACK STATE   = FALSE
      [dsx1T16AIS] T16 AIS                 = FALSE
      [dsx1RcvFarEndLOMF] RCV FAR END LOMF = FALSE
      [dsx1XmtFarEndLOMF] XMT FAR END LOMF = FALSE
      [dsx1RcvTestCode] RCV TEST CODE      = FALSE
```

```
      [dsx1OtherFailure] OTHER FAILURE     = FALSE
[dsx1SendCode]
   Span1 Send Code is:                       SEND NO CODE
[dsx1SendNoCode]
[dsx1LoopbackConfig]
   Span1 dsx1 Loopback Configuration is:     NO LOOP
[dsx1NoLoop]
[uds1StatReceiverGain]
   Span1 Receiver Gain is: ................. 0.0 DB GAIN
[dB0]
[uds1StatE1ContCrc]
   Span1 Continuous CRC Error is:            FALSE [false]
[uds1StatE1PhysicalState]
   Span1 Physical State is:                  F1 OPERATIONAL
[psF1Operational]
[uds1StatLoopBackInit]
   Span1 Loopback Init Originate is: ........ NONE [none]
[modemNotAvailable]
   Span1 Modem Not Available Count is:        0
[inCallInvalidBearerCapa]
   Span1 Invalid Bearer Capability Count is:  0
[inCallInvalidChannelID]
   Span1 Invalid Channel ID Count is: ....... 0
[inCallInvalidProgressInd]
   Span1 Invalid Progress Indicator Count is: 0
[inCallInvalidCallingParty]
   Span1 Invalid Calling Party Count is:      0
[inCallInvalidCalledParty]
   Span1 Invalid Called Party Count is: ..... 0
[inCallCallBlock]
   Span1 Call Block Failure Count is:         0
[inCallLoopStartNoRingOff]
   Span1 No Ring Off Failure Count is:        0
[outCallTelcoDisconnect]
   Span1 Telco Disconnect Failure Count is: . 0
[outCallEMWinkTimeOut]
   Span1 TELCO Failed To Wink Count is:       0
[outCallEMWinkTooShort]
   Span1 TELCO Wink Too Short Count is:       0
[outCallNoChannelAvail]
   Span1 No Channel Available Count is: ..... 0
[discNoTelcoRespDialIn]
   Span1 Dial In No Resp To Disc Count is:    0
[discNoTelcoRespDialOut]
   Span1 Dial Out No Resp To Disc Count is:   0
[discNoTelcoRespGround]
```

```
   Span1 Gnd Start No Resp To Disc Count is:  0
[uds1StatSwitchTypeActive]
   Span1 Switch Type Active is:              5ESS [priSw5ESS]
[uds1StatDchanOperational]
   Span1 D-channel Operational is:           UP [dChannelUp]
[udsx1SignalModeActive]
   Span1 Signal Mode Active is:             MESSAGE ORIENTED
[messageOriented]
```

Modem/DS0 Mapping

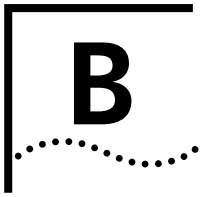
By using a modem routing method, you can call a specific modem that you want to examine.

After the call is connected, enter "display ats" at the span prompt to determine which Modem is connected to which DS0.

`span1> set mdmrm`

Valid Set Modem Routing Method [CfgMdmRoutingMethod] sub-commands are:

To choose	Command
A modem based on Fixed DS0 assignment	set mdmrm fixeda
The first-available modem	set mdmrm 1stavail
The next-available modem in pool starting from last modem used	set mdmrm rndrobin



Trouble Clearing the Modems

This appendix contains:

- Trouble Clearing x2 / V.90
- Viewing ATI6
- Viewing ATI11
- What to do if you still have problems

Using AT Commands

For more information about AT commands, see Chapter 7, Using AT Commands and Appendix E, AT Commands at a Glance.

Checking the Firmware Version

Before you perform any troubleshooting, ensure that you have the correct version of the HiPer DSP firmware.

To determine HiPer DSP software build versions, switch to the modem level and view the ATI7 screen.

```
>chdev mdm
mdm1>ati7
```

Factory Defaults

The factory defaults are valid for most configurations. If you have problems with connecting, reset the factory defaults (AT&F).

```
mdm1>at&f
```

Then, if needed, make any special parameter updates.

Modem Statistics

Use modem statistics to determine why the modem cannot connect or connects at a lower rate than expected. Use the ATI6 screen to view modem statistics.

```
>chdev mdm
mdm1> ati6
```

Trouble Clearing x2/V.90

Use the following chart to determine why HiPer DSP with x2 / V.90 may not negotiate x2 / V.90 speeds.

Trouble Clearing V.90 Server Connections

If V.90 client modems cannot connect at V.90 speeds to your V.90 server HiPer DSP, use the chart below to determine problems at the server end and how to fix them:

For the rest of this chapter, V.90 refers to x2 / V.90.

Possible Problem:

You may have an analog line, or a "line-side" T1 connection. A line-side T1 connection has an analog-to-digital conversion between HiPer DSP and the PSTN.

Solution:

Contact your local telephone company for information about obtaining pure digital service. A pure digital service can be obtained by deploying either a PRI or "trunk-side" T1 connection to the PSTN.

If V.90 server connections still do not work

If V.90 server connections still do not work, contact 3Com. Contact information is in the About This Product Reference section of this reference.

Trouble Clearing V.90 Client Connections

If V.90 client modems cannot connect at V.90 speeds to your V.90 server HiPer DSP, use the chart below to determine problems at the client end and how to fix them:

Step	This may be the problem	Do this
1	V.90 may not be enabled on the client V.90 modem	Refer the user to the section "How to Tell if V.90 is Enabled in Your Modem" in the documentation for the client modem
2	The V.90 client modem may be connected to the public network via a PBX or other telephone equipment with more than one analog-to-digital conversions	Due to extra analog-to-digital conversions performed by some PBX's and other telephone equipment, V.90 client modems may not be able to make 56K connections

If V.90 server connections still do not work, contact 3Com. Refer to the contact information in the About This Guide section of the HiPer DSP Product Reference.

Viewing the ATI6 Display

This is a standard AT screen which a user can query when the modem is online or offline to obtain important statistics, including:

- Data transmit/receive statistics
- Protocol (LAPM)
- Speed (33600)
- Data compression (V42bis)
- Disconnect reason
- Failure to connect reason

The following is an example of the ATI6 screen:

```
> chdev mdm 1
mdm1> ati6
Modem Link Diagnostics...
Chars Sent                      0
Chars Received                  0
Chars Lost                      0
Octets Sent                   449
Octets Received               362
Blocks Sent                    13
Blocks Received                39
Blocks Resent                   0
Retrains Requested              0
Retrains Granted                0

Link Timeouts                   0
Link Naks                       0
Blers                           0
Data Compression    V42BIS
Equalization        LONG
Fallback            ENABLED
Protocol            LAPM
Speed               33600/33600
Current Call        00:00:26
Online
OK
```

Viewing the ATI11 Display

The ATI11 is another standard AT screen where you can find useful information about an active call, including:

- Modulation (e.g. V.34)
- Receive/transmit level
- Signal-to-noise ratio (SNR)

The following is an example of the ATI11 screen:

```
mdm19> ati11
Modem Link Diagnostics...
Modulation (recv/xmit)     V.34
Carrier Freq    ( Hz )    1959/1959
Symbol Rate               3429/3429
Trellis Code              645-4D/645-4D
Nonlinear Encoding        On/Off
Precoding                 Off/Off
Shaping                   Off/Off
Preemphasis     (-dB )    2/2
Recv/Xmit Level (-dBm)    11.9/12.3
SNR             ( dB )    45.2
Near Echo       ( dB )    46.1
Far Echo        ( dB )    49.2
Roundtrip Delay (msec)    8
Timing Offset   ( ppm)    -48
Carrier Offset  ( ppm)    16
x2/V.90 Status             x2 Operational
x2/V.90 Signature          uuuu-uuuu-uu00
OK
```

ATI11 Defintions

Symbol Rate: This refers to data rate, or sometimes called baud rate. V.32/bis/ter always uses 2400 symbol rate. Each symbol may contain 2,3,4,... 9 bits, giving 4800, 7200, 9600, ... 21600 bits/second. In addition to 2400, V.34 defines 2743, 2800, 3000, 3200, and 3429 symbol rates, where 2743, 2800, and 3429 are optional. 3429 is necessary to do 33.6 kbps. The Quad modems in digital mode do not use 2800. V.34 uses shell mapping to encode the data bits into each symbol, which does not always send the same number of bits for each symbol. x2 and V.90 servers send at the network rate of 8000 Hz and receive at the V.34 rates.

Trellis Code/Coding: A method for improving error correction and noise immunity using a convolutional coder to select a sequence of subsets in a partitioned signal constellation (V.34 recommendation). Used in HST, V.17 Fax, V.32bis, V.FC, and V.34.

Nonlinear Encoding: A method for improving distortion immunity near the perimeter of a signal constellation by introducing a non-uniform two-dimensional (2D) signal point spacing (V.34 recommendation). This term is not critical to user procedures.

Precoding: A non-linear equalization method for reducing equalizer noise enhancement caused by amplitude distortion. Equalization is performed at the transmitter using precoding coefficients provided by the remote modem (V.34 recommendation). Precoding is similar to Pre-emphasis--during training, the modem analyzes the line and adapts its equalizer to compensate for the line rolloff. In V.34, the modem can send parameters to the remote modem to tell it to pre-compensate for the line rolloff with precoding and preemphasis. Therefore, the receiving modem does not need to amplify the signal as much, which also amplifies the noise. If really sharp cutoff filters are in the network, even precoding and preemphasis won't help.

(Constellation) Shaping: A method for improving noise immunity by introducing a non-uniform two-dimensional probability distribution for transmitted signal points. The degree of constellation shaping is a function of the amount of constellation expansion (V.34 recommendation). This term is not critical to user procedures.

Pre-emphasis: A linear equalization method where the transmit signal spectrum is shaped to compensate for amplitude distortion. The pre-emphasis filter is selected using a filter index provided by the remote modem (V.34 recommendation).

Carrier Offset and Timing Offset: These terms are related to the timing recovery in modems. Analog modems derive their timing from a crystal on the modem. Since these crystals do not use the same frequency, the modem needs to compensate for this. These numbers represent the difference in frequency and phase of the symbol rate in Hz between the two modems. Previous versions of code have a display that is calibrated differently.

What to Do If You Still Have Problems

The problems described above are by far the most common ones that users encounter. If the suggestions we've given don't clear up your difficulties, try the following:

1. Review the manual carefully to see if you've missed something.
2. Contact 3Com Technical Support. Contact information is in the About This Product Reference section of this reference.

For information about call fails or modem disconnects refer to Appendix C, Trouble Clearing Call Fails and Modem Disconnects

C

Trouble Clearing Call Fails and Modem Disconnects

For many reasons users may fail to connect their computer to a Total Control Server (TCS). Also, when a user does connect their computer to a TCS, modems on either the user end or the remote-access end may disconnect. 3Com refers to such instances as call fails and modem disconnects respectively.

In this appendix, you learn how to trouble clear the most common call fails and modem disconnects, which relate to HiPer DSP.

Call Fails

Use the following information to trouble clear call fails:

- Have you gathered all the appropriate information from the telephone company and configured the card accordingly?
- Did you request an analog/digital PRI from the telephone company? Many times, customers request digital service only; therefore, no analog calls connect.

To trouble clear the following problems, use TCM. TCM is the only interface you can use to configure HiPer DSP templates.

- Are your modems configured properly? If HiPer DSP drops calls immediately, under Call Control Options for HiPer DSP, make the following changes using the Total Control Manager configuration utility:

  1 Save these settings to the modems' NVRAM and to the modem templates.

Call Control Option	Setting
Result Codes (Qn)	displayResult
Verbal/Numeric Result Codes (Vn)	verbal

Call Control Option	Setting
Result Code Groups (X)	0
ARQ Result Codes (&A)	arqResultsDisabled
Response to +++	ignoreEscCode

2 Refresh the template (do not restore the template).

- Are you using the correct software versions for HiPer DSP and NMC, and again, have you configured the HiPer DSP properly? One of the most common problems is when a call connects to the HiPer DSP, and the HiPer DSP then sends the username and password to the RADIUS server. The RADIUS server replies to the HiPer ARC accepting the signal, but the call is somehow dropped, and the HiPer DSP never receives any data. If you have that problem, do the following:

  1 Make sure you are using the following software versions or newer: HiPer DSP 1.2.5 and NMC 5.5.5.

  2 Click the modem utilization bar and go to configure/action commands and restore from default.

  3 Save to NVRAM.

  4 Select the card, and click Configure/Action commands and restore template 1 configuration from default.

  5 Save template 1 configuration to NVRAM.

  6 Finally, hardware reset the card.

For more information about trouble clearing call fails, refer to the following table:

Call Fail	Description	Trouble Clearing Notes
Keypress Abort	The modem detected a keypress while training.	The remote modem user is responsible.
MNP incompatibility	The modem is set to &M5 and the remote modem does not have MNP capability, or there was an MNP negotiation procedure error.	Route the user to a modem with MNP disabled.

Call Fail	Description	Trouble Clearing Notes
Invalid speed	The modem is set to a specific speed or a range of speeds and the remote modem is not operating at the same rate.	Route the remote modem's signal to another modem with the same rate or reconfigure the modem's rate.
XID Timeout	The modems failed to negotiate the V.42 Detection (XID Exchange) phase.	N/A
SABME Timeout (Set Asynchronous Balance Mode Extended)	The modems failed this part of V.42 link negotiation.	Set asynchronous balance mode extended.

Modem Disconnects

Use the following table to trouble clear modem disconnects:

To better distinguish call fails from modem disconnects, understand that modems connect only after they negotiate a speed and protocols. Therefore, if modems make contact with each other but cannot complete the negotiation, 3Com considers that scenario a call fail.

Disconnect Reason	Description	Trouble Clearing Notes
Escape code	The operator sent the modem the +++ escape code.	The remote modem user is responsible.
GSTN (General Switch Telephone Network) Clear Down	The connection was non-ARQ and DTR was dropped from one side of the connection, or the DISC frame was corrupted due to noise.	If the call is not dropped deliberately by either party, try connecting again. If the call disconnects repeatedly, try a lower connection speed.
Loss of carrier	The modem detected loss of the remote modem's carrier and waited the duration specified in S10 (default is 0.7 seconds).	Sometimes call waiting signals can interrupt a remote modem's carrier, thus a longer duration should be specified in S10--preferably 2 seconds.
Inactivity timeout	The modem detected no activity on the line for the duration specified in S19 (default is 0, timer disabled).	If necessary, specify a longer duration in S19.

Disconnect Reason	Description	Trouble Clearing Notes
Retransmit limit	The modems reached the maximum of twelve attempts to transfer a data frame without error.	Study the data frame errors to further diagnose the problem.
LD received	The remote modem sent an MNP error control Link Disconnect request.	The remote modem may have sent an unauthorized +++ATH or it may have dropped DTR.
DISC	The remote modem sent a V.42 Disconnect frame.	This reflects normal operation, but it can also reflect a user software error. The user software may issue an unauthorized +++ATH or it may drop the DTR on the remote modem.
Loop loss disconnect	The modem detected a loss of current on the loop connecting it with the telephone company central office.	This usually occurs because the remote modem has hung up.
Unable to Retrain	After several attempts, disturbances on the phone line prevented the modems from retraining, and they could no longer transmit or receive data.	Resolve phone line disturbances with the telco.
Break Timeout	Incompatible processing of a Break signal occurred.	Try connecting again.
Invalid Codeword	The modem received an invalid V.42 bis frame.	This disconnect reason is very infrequent.
A Rootless Tree	The modem received an invalid V.42 bis frame.	Try connecting again. If this fails repeatedly, tryp MNP or normal mode instead of V.42/V.42 *bis*.
Illegal Command Code	The modem received an invalid V.42 bis frame.	This disconnect reason is very infrequent.
Extra Stepup	The modem received an invalid V.42 bis frame.	N/A
Normal User Call Clear	The network cleared a call when it received a disconnect from a gateway card.	This is a Q931 telco clear condition.

What to Do If You Still Have Problems

The problems described above are by far the most common ones that users encounter. If the suggestions we've given don't clear up your difficulties, try the following:

1. Review the manual carefully to see if you've missed something.
2. Contact 3Com Technical Support. Contact information is in the About This Product Reference section of this reference.

For more information about call fails and modem disconnects, refer to Chapter 8, Viewing the Modem Settings and Statistics, and also refer to the SNMP and MIB Reference on the TCS 3.5 CD.

D

UPGRADING WITH SOFTWARE DOWNLOAD 2

This appendix contains:

- What you need to upgrade with Software Download 2
- Checking the software version
- System requirements
- Before using Software Download 2
- Downloading the code
- Reusing Old Software Versions

Overview

New Firmware Releases

3Com periodically releases updates and enhancements to Total Control operating software on the 3Com TOTALService Website.

Included with your HiPer DSP is the latest software version for a Total Control HiPer DSP Network Application Card (NAC). You must install this software on a management station before installing it to a NAC.

You can also use the Total Control Manager to upgrade HiPer DSP.

What Is Software Download 2?

Commonly known as SDL2, it is a utility that allows you to download software to HiPer DSP NAC via a serial link both locally and remotely.

The management station must support ZMODEM file transfer protocol.

HiPer DSP 2.0 also supports SDL1, software download via Total Control Manager. Refer to the Total Control Manager documentation for more information.

What You Need

To send the new code to HiPer DSP modem, you need a standard terminal program that can send files using the ZMODEM protocol.

Checking the Software Version

From the Console Interface, enter ATI7 at a modem prompt to display product configuration.

The following information appears:

```
mdm1> ati7
Modem Configuration Profile

Product Type              US/Canada Rackmount
Serial Number             123456789ABC
Slot/Channel              2/1
Modem Options             V.32, V.34+, x2/V.90
ISDN Options              V.110, V.120, X.75, Sync PPP
Cellular Options          None
Fax Options               None
Span Options              PRI/T1, CHT1
Channel Capacity          24
RISC Clock Frequency      60MHz
DSP Clock Frequency       75MHz
Board Manager Flash ROM   2Mb
Board Manager RAM         8Mb

Boot Block Date           09/11/98
Board Manager Date        09/11/98
ACP Date                  09/11/98
DSP Date                  09/11/98

Boot Block Revision       0.0.0
Board Manager Revision    2.0.4
ACP Revision              2.0.4
DSP Revision              2.0.4

OK
```

To determine if you have a recent version of HiPer DSP software, view the Date and revision of the Boot Block, Board Manager, ACP, and DSP.

The best way to find out the current version of HiPer DSP software is to call 3Com Technical Support at the number listed on the Customer Support Services card included with HiPer DSP.

System Requirements

You will need a computer with a serial port capable of link rates up to 115200 bps, and a null modem cable with RJ45 and RS232 on each end.

Before Using Software Download 2

Set your terminal program to 115200 bps, 8 bits per character, no parity, one stop bit, and hardware flow control on.

*HiPer DSP link port speeds are fixed and cannot be changed. Although either port can be used, 3Com recommends using the **Auxiliary port**, which has a standard 115200 bps interface, when downloading HiPer DSP Software.*

Downloading the Code

Use the following steps to download HiPer DSP software.

If power to HiPer DSP NAC is removed during any of the following software download steps, this software download procedure must be restarted.

1. Run a terminal program that supports the ZMODEM transfer protocol (such as HyperTerminal).
2. Manually reboot the HiPer DSP by pulling the card and re-inserting it.
3. When the following "Enter Download Trigger" prompt appears, enter **AT{Z}**.

   ```
   "__ Enter Download Trigger __"
   ```

4. Using your terminal program, immediately select and send the boot file.

   You must enter **AT{Z}** capitalized. If you use lower case, the download will not function. Also you must begin sending the files before the hardware reboot cycle begins. The hardware reboot cycle begins about 10 seconds after you manually reboot the card.

   The download is complete when the following appears:

   ```
   "0;Download successful: File=file.dmf"
   Programming flash
   "!!-----> SDL2 for the PPC403 <-------!!"
   "__ Enter Download Trigger __"
   ```

Do not input the trigger when prompted the second time unless you want to re-download the code.

The software download is now complete. HiPer DSP console operations can be performed as soon as the operational image has booted and the password prompt appears.

Normal console operations will not function on the Auxiliary port. Be sure to move the terminal connection to the Console port (at 9600 bps) and reset the card as outlined in step 2.

Reusing Old Software Versions

Each new software release includes additional functionality and changes to the configuration file. If you plan to reuse old software versions after upgrading to a newer software version, you must archive your older configurations.

Before upgrading HiPer DSP software, archive your current configurations using Total Control Manager. Therefore, previous configurations will be available if you downgrade to a previous software version.

When restoring configurations, be sure the configuration file is from the current software version. If not, you may experience problems with functionality. Newer software features may not function. Also, the HiPer DSP may reload its defaults—possibly misconfiguring settings, such as switch type.

Refer to the Total Control Manager Online Help System for information about saving configurations.

If you have a service contract, you can download all HiPer DSP software versions from the TOTALService web site: http://totalservice.usr.com/

E

AT Commands at a Glance

This appendix contains:

- Basic AT commands
- Advanced AT commands
- S-Register descriptions
- S-Registers not used by HiPer DSP
- How to use S-Registers
- How to use bit-mapped S-Registers

Basic AT Commands

The following table lists all AT commands supported by HiPer DSP.

Command	Description
$	Help basic command summary
A	Force answer mode
A/	Repeat previous command
AT	Attention. Must precede all commands except A/ and +++
D$	Help dial command summary
Ds	Dial the phone string that follows
DL	Dial the last-dialed number
DSn	Dial number stored in flash at position n
E0	Command mode local echo
E1	Command mode local echo OFF
E2	Command mode local echo ON
I3	Call duration (real time clock mode not supported)
I4	Current modem settings
I5	Flash settings
I6	Link diagnostics

Command	Description
I7	Product configuration
I9	Standard feature group B settings
I11	V.34 DSP oriented link diagnostics connection information
Q0	Result codes display
Q1	Display result codes
Q2	suppress result codes (quiet mode)
S$	Help s-register summary
Sr=n	Set s-register command. r is any s-register; n is a decimal from 0-255
Sr.b=v	Set bit b of s-register r to v; v must be 0 or 1
Sr?	Query s-register r
V0	Numeric result codes
V1	Verbal result codes
X0	Basic result codes
X1	Extended result codes
X2-X7	Advanced result codes

Ampersand Commands

The following table is a complete list of ampersand commands.

Command	Description
&$	Help ampersand command summary
&An	ARQ result codes &A0 Suppress ARQ result codes &A1 Display ARQ result codes &A2 Display modulation result codes &A3 Display protocol result codes
&Fn	Load factory defaults into RAM &F0 Load factory configuration
&K	Data compression &K0 Disable data compression &K1 Auto enable/disable data compression &K2 Enable data compression &K3 V.42bis only

Command	Description		
&Mn	Error control/Synchronous options		
	&M0 Normal mode; no error control		
	&M1-3 Not used in HiPer DSP		
	&M4 Normal - Use if ARQ connection cannot be made		
	&M5 ARQ mode. Modem hangs up if ARQ connection is not made		
	&M6-7 Not used in HiPer DSP		
&Nn	Set maximum Link rate		
	&N0 None	&N11 21.6 kbps	&N22 45.333 kbps
	&N1 300 bps	&N12 24 kbps	&N23 46.666 kbps
	&N2 1200 bps	&N13 26.4 kbps	&N24 48 kbps
	&N3 2400 bps	&N14 28.8 kbps	&N25 49.333 kbps
	&N4 4800 bps	&N15 31.2 kbps	&N26 50.666 kbps
	&N5 7200 bps	&N16 33.6 kbps	&N27 52 kbps
	&N6 9600 bps	&N17 33.333 kbps	&N28 53.333 kbps
	&N7 12 kbps	&N18 37.333 kbps	&N29 54.666 kbps
	&N8 14.4 kbps	&N19 41.333 kbps	&N30 56 kbps
	&N9 16.8 kbps	&N20 42.666 kbps	&N31 57.333 kbps
	&N10 19.2 kbps	&N21 44 kbps	&N32 64 kbps
&Un	Set minimum link rate		
	&N0 None	&N5 7200 bps	&N10 19.2 kbps
	&N1 300 bps	&N6 9600 bps	&N11 21.6 kbps
	&N2 1200 bps	&N7 12 kbps	&N12 24 kbps
	&N3 2400 bps	&N8 14.4 kbps	&N13 26.4 kbps
	&N4 4800 bps	&N9 16.8 kbps	&N14 28.8 kbps
&W	Write current settings to Flash memory		
&Zn=L	Store last-dialed number in flash at position n, where n=0-3		
&Zn=s	Write phone number string s to flash at position n, where n=0-3		
&Zn?	Query phone number stored in flash at position n, where n=0-3		

Percent Commands

The following table is a complete list of percent commands.

To set	Command
Carrier access code (CAC) number at position n, where n=1-3. s is string of up to 10 digits.	%CNn=s
CAC associated initialization string at position n, where n=1-4. s is string of up to 30 characters.	%CIn=s

Asterisk Commands

The following table is a complete list of asterisk commands.

Command	Description
*U1=n	Originate Mode HDLC Protocol Selection
	n=0 None
	n=1 V.120
	n=2 X.75
	n=3 Async-to-sync PPP
*U2=n	Originate Mode Non-HDLC Protocol Selection
	n=0 None
	n=1 V.110
*U3=n	Originate Mode Analog Modem/Fax Selection
	n=0 None
	n=1 Analog modem/fax
*V2=n	Originate/Answer Mode Protocol Selection
	n=0 Auto Detect
	n=1 V.120 rate adaption only
	n=2 V.110 rate adaption only
	n=3 Modem/fax emulation only
	n=4 Clear channel only
	n=5 Asynchronous-to-synchronous PPP only
	n=6 X.75 only
*X0=n	X.75 Frame size in bytes
	n=1 minimum n=2048 maximum
*X1=n	X.75 Window size in frames
	Valid range 1 to 7

S-Registers

HiPer DSP Supports the Following S-Registers

Register	Default	Function
S2	43	Stores the ASCII value for the escape code character. Default character is "+".Valid range is 0–127.Values of 128–255 disable the escape code.
S3	13	Stores the ASCII value for the Carriage Return character. Valid range is 0–127.
S4	10	Stores the ASCII value for the Line Feed character. Valid range is 0–127.
S5	8	Stores the ASCII value for the Backspace character. Valid range is 0–127.Values of 128–255 disable the Backspace key's delete function.
S6	2	Sets the number of seconds the modem waits before dialing. If there is no dial tone, the modem observes the normal S6 timeout and returns a NO DIAL TONE result code. The setting of this register only applies to channelized T1 loop start.
S7	60	Sets the number of seconds the modem waits for a carrier before aborting the call.
S8	2	Sets the duration, in seconds, for the pause (,) option in the Dial command and the pause between command reexecutions (> and A> commands).
S9	6	Sets the required duration, in tenths of a second, of the remote modem's carrier signal before recognition. The modem ignores this register above 2400 bps.
S10	7	Sets the duration, in tenths of a second, that the modem waits after loss of carrier before hanging up. This guard time allows the modem to distinguish between a line hit, or other disturbance that momentarily breaks the connection, from a true discon-nect (hanging up) by the remote modem.ATS10=255 causes the modem to remain off hook despite loss of carrier; the modem hangs up only if it is returned to command mode and sent the ATH command.
S11	70	Sets the duration and spacing, in milliseconds, of dialed tones.

<table>
<tr><th>Register</th><th>Default</th><th>Function</th></tr>
<tr><td>S13</td><td>0</td><td>Bit-mapped register with many functions.

Bit | Value | Result
0 | 1 | Not used in HiPer DSP
1 | 2 | Reverse normal Auto Answer operation on incoming RING, enter Originate Mode and look for answer tone.
2,3,4,5 | 4,8,16,32 | Not used in HiPer DSP
6 | 64 | Disable MNP Level 3 (used for testing Level 2)
7 | 128 | Not used in HiPer DSP</td></tr>
<tr><td>S15</td><td>0</td><td>Bit-mapped register with many functions.

Bit | Value | Result
0 | 1 | Not used in HiPer DSP.
1 | 2 | Disable online fallback.
2 | 4 | Not used in HiPer DSP.
3 | 8 | Reset non-ARQ Transmit buffer from 1.5K byte to 128.The default 1.5K byte non-ARQ buffer allows data transfer with X- and YMODEM-type file transfer protocols without using flow control. The 128-byte option allows remote users with slower modems to stop data you're transmitting from scrolling off their screens. When remote users send your computer an XOFF (<Ctrl-S>) and you stop transmitting, the data in transit from your modem's buffer doesn't exceed the size of their screen.
4 | 16 | Disable MNP Level 4. Use this if you expect numerous errors druing a call.
5 | 32 | Not used in HiPer DSP.
6 | 64 | Disable 2400 bps MNP connections. SOme earlier 2400 bps MNP modems have difficulty making 2400 bps MNP connection with a remote MNP modem.
7 | 128 | Not used in HiPer DSP.</td></tr>
<tr><td>S18</td><td>0</td><td>Sets the duration of testing, in seconds, before the modem automatically times out and terminates the test. See Appendix E for more information.</td></tr>
</table>

<table>
<tr><th>Register</th><th>Default</th><th>Function</th></tr>
<tr><td>S19</td><td>0</td><td>Sets the duration, in minutes, for the Inactivity Timer. The timer activates when there is no data activity on the phone line and at the timeout the modem hangs up. ATS19=0 disables the timer.</td></tr>
<tr><td>S27</td><td>0</td><td>Bit-mapped register, which disables many features.
Bit Value Disables
0 1 V.21 modulation at 300 bps for internation calls. In V.21 mode, the modem answers Bell 103 and V.21 calls, but only originates V.21 calls.
1 2 Trellis Code Modulation
2 4 V.32
3 8 2100 Hz answer tone to allow two V.42 modems to connect more quickly.
4,5 16,32 Use bit 4 in conjunction with bit 5.
To disable Bit 4 Bit 5
MNP 16 0
V.42 Detection and LAPM. 0 32
Detection phase if you know that the remote modem does LAPM, but not the Detection phase. 16 32
6,7 64,128 Not used in HiPer DSP.</td></tr>
<tr><td>S28</td><td>8</td><td>Sets the duration, in tenths of a second, of the extra 3000/600 Hz answer tones sent during V.32 hand-shaking. This gives V.32 modems additional time to connect in V.32 mode before timing out.If there is difficulty answering older, manually operated V.32 modems, lengthen the duration of the extra tones.To eliminate the extra tones, set ATS28=0.</td></tr>
</table>

Register	Default	Function
S34	0	Bit-mapped register, which disables many features.

Bit	Value	Disables
0	1	V.32 *bis*
1	2	Enhanced V.32 *bis* modulation
2	4	Faster V.32 *terbo* retrain
4,5,6	16,32,64	Not used in HiPer DSP
7	128	V.32 *terbo*

S39	11	Adjusts the transmitter level to provide optimal perfomance for most analog sources. Ranges: -0 to -20 dBm for analog line sources and -3 to -30 dBm for digital T1 line sources. A setting of -13 dBm (S39=13) is recommended for calls over digital lines (T1 or PRI).
S47	2	Bit-mapped register that regulates aspects of a digital T1 line. See also S62 and S63.

Bit	Value	Result
0	1	No call setup procedures are followed to request a T1 dial-out or dial-in line. Assumes that dedicated (leased) DS0 is assigned to the modem.
1	2	Dial-out signaling using DTMF tones.
2	4	No KP or STMF tones are transmitted.
3	8	Disable auto-configuration of modem setting based on Feature Gourp B/D.
4	16	Use auto-configuration based on ANI (instead of DNIS).
5,6,7	32,64,128	Not used in HiPer DSP.

Register	Default	Function		
S48	0	Bit-mapped register that disables selective modulation.		
		Bit	**Value**	**Disables**
		0	1	MNP/V.42 for V.22 (1200 bps)
		1	2	MNP/V.42 for V.22 (2400 bps)
		2	4	MNP/V.42 for V.32/V.32 bis/V.32 terbo (9600/14,400/19,200)
		3,4,5	8,16,32	Not used in HiPer DSP
		6	64	Selective Reject
S50	100	Sets the billing delay period.		
S51	64	Bit-mapped register.		
		Bit	**Value**	**Disables**
		0	1	MNP/V.42 for V.22 (1200 bps)
		1	2	MNP/V.42 for V.22 (2400 bps)
		2	4	MNP/V.42 for V.32/V.32 *bis*/V.32 *terbo* (9600/14,400/19,200)
		3,4,5	8,16,32	Not used in HiPer DSP
		6	64	Selective Reject
		7	128	Not used in HiPer DSP
S52	5	Sets the duration in seconds, of the MNP link request timeout.		
S54	192	Symbol rate bit-mapped register used primarily by 3Com Technical Support.		
		Bit	**Value**	**Disables**
		0	1	2400 symbol rate
		1	2	2743 symbol rate
		2	4	2800 symbol rate
		3	8	3000 symbol rate
		4	16	3200 symbol rate
		5	32	3429 symbol rate
		6	64	V.8 Call Indicate (Disabled by default)
		7	128	V.8

<table>
<tr><th>Register</th><th>Default</th><th>Function</th></tr>
<tr><td>S55</td><td>0</td><td>Trellis code bit-mapped register used primarily by 3Com Technical Support for debugging purposes.
Bit | Value | Disables
0 | 1 | 8S-2D mapping
1 | 2 | 16S-4D mapping
2 | 4 | 32S-2D mapping
3 | 8 | 64S-4D mapping
4,5,6,7 | 16,32,64,128 | Not used in HiPer DSP</td></tr>
<tr><td>S56</td><td>0</td><td>Bit-mapped register primarily used by 3Com Technical Support for debugging purposes.
Bit | Value | Disables
0 | 1 | Non-linear coding mode
1 | 2 | TX level deviation mode
2 | 4 | Pre-emphasis mode
3 | 8 | Precoding mode
4 | 16 | Shaping mode
5 | 32 | V.34+ mode
6 | 64 | V.34 mode
7 | 128 | V.FC mode</td></tr>
<tr><td>S61</td><td>0</td><td>Regulates the V.42 bis Short Form Negotiation rules. The short form assumes that the maximum string length is always 32 octets and that the direction of compression is always bi-directional.</td></tr>
<tr><td>S72</td><td>0</td><td>ATZ handling.</td></tr>
</table>

Register	Default	Function					
S74	0	Low-speed channel minimum speed in bps (x2/V.90 only).					
		0	Normal	11	21,600	22	45,333
		1	300	12	24,000	23	46,666
		2	1200	13	26,400	24	48,000
		3	2400	14	28,800	25	49,333
		4	4800	15	31,200	26	50,666
		5	7200	16	33,600	27	52,000
		6	9600	17	33,333	28	53,333
		7	12,000	18	37,333	29	54,666
		8	14,400	19	41,333	30	56,000
		9	16,800	20	42,666	31	57,333
		10	19,200	21	44,000	32	64,000
		9	16,800	20	42,666	31	57,333
		10	19,200	21	44,000	32	64,000
S75	0	Low-speed channel maximum speed (x2/V.90 only).					
		0	Normal	11	21,600	22	45,333
		1	300	12	24,000	23	46,666
		2	1200	13	26,400	24	48,000
		3	2400	14	28,800	25	49,333
		4	4800	15	31,200	26	50,666
		5	7200	16	33,600	27	52,000
		6	9600	17	33,333	28	53,333
		7	12,000	18	37,333	29	54,666
		8	14,400	19	41,333	30	56,000
		9	16,800	20	42,666	31	57,333
		10	19,200	21	44,000	32	64,000

<table>
<tr><th>Register</th><th>Default</th><th>Function</th></tr>
<tr><td>S76</td><td>0</td><td>A bit-mapped S-register, which disables x2/V.90 Mode and Remote Server transmit control.

Bit | Value | Disables
0 | 1 | Client mode
1 | 2 | Server mode
2 | 4 | Symmetric mode
3 | 8 | x2/V.90 mode fallback to V.34
4,5,6,7 | 16,32,64,128 | Not used in HiPer DSP</td></tr>
<tr><td>S81</td><td>0</td><td>Designates where to apply the V.90 transmit power limit and enables or diables the digital interface.

It applies it to the output of the server modem or to the input of the far-end CODEC.

Bit | Value | Default
0 | 1 | V.90 transmit power limit to the input of the far-end CODEC.
1 | None | Reserved
2 | None | Reserved
3 | None | Reserved
4 | None | Reserved
5 | 32 | Enables V.90 modulation
6 | None | Reserved
7 | None | Reserved</td></tr>
<tr><td>S82</td><td>12</td><td>Sets the server’s transmit power limit. The value of this register is interpreted as negative dBm. The default is set according to the country code in the modem as follows:

■ 6 --Default for HiPer DSPs with the country code set to either France, the U.K., or Africa)
■ 12 --Default for HiPer DSPs with the country code set to USA or other small countries
■ 15 --Default for HiPer DSPs with the country code set to Japan</td></tr>
</table>

<table>
<tr><th>Register</th><th>Default</th><th>Function</th></tr>
<tr><td>S89</td><td>0</td><td>A bit-mapped S-register, which enables various modem features specific to the support of the HiPer TRAX X.25 gateway.
<table>
<tr><th>Bit</th><th>Value</th><th>Result</th></tr>
<tr><td>0</td><td>1</td><td>Call type options. See table below.</td></tr>
<tr><td>1</td><td>2</td><td>Call type options. See table below.</td></tr>
<tr><td>2</td><td>4</td><td>Enables fast train 1200 bps detection.</td></tr>
<tr><td>3</td><td>8</td><td>Enables fast train 2400 bps detection.</td></tr>
<tr><td>4</td><td>16</td><td>Low speed handshake options. Valid only for rates 2400 bps and less. See table below</td></tr>
<tr><td>5</td><td>32</td><td>Low speed handshake options. Valid only for rates 2400 bps and less. See table below</td></tr>
<tr><td>6</td><td>64</td><td>Disable answer tone.</td></tr>
<tr><td>7</td><td>128</td><td>Expedite first RX character.</td></tr>
</table>
Call type options: select the total values of bits 0 and 1
<table>
<tr><th>Bit 0</th><th>Bit 1</th><th>Result</th></tr>
<tr><td>0</td><td>0</td><td>Asynchronous only (X.25 call).</td></tr>
<tr><td>0</td><td>1</td><td>Trax asynchronous only (transaction).</td></tr>
<tr><td>1</td><td>0</td><td>Trax STP only.</td></tr>
<tr><td>1</td><td>1</td><td>Trax auto detection.</td></tr>
</table>
Low speed options: select the total values of bits 4 and 5
<table>
<tr><th>Bit 4</th><th>Bit 5</th><th>Result</th></tr>
<tr><td>0</td><td>0</td><td>USB1 lowspeed handshaking</td></tr>
<tr><td>0</td><td>1</td><td>USB1 lowspeed handshaking</td></tr>
<tr><td>1</td><td>0</td><td>B212A lowspeed handshaking</td></tr>
<tr><td>1</td><td>1</td><td>Both USB1 and B212A Hz</td></tr>
</table></td></tr>
<tr><td>S90</td><td>10</td><td>Enables the fast train connect window—the 0.02 second increments that the modem will wait for an idication of a fast connect training pattern.</td></tr>
</table>

The following S-Registers are not supported by HiPer DSP

S0-1, S12, S17, S20-26, S30, S32-33, S35-36, S38, S40-46, S53, S57-S60, S62-66, S69-71.

Using S-Registers

S-Registers are addresses of places in memory where various timing parameters, redefinitions of selected ASCII characters, and other configuration settings are stored.

Initially, the S-Register settings for each of the templates are the same. As with any setting stored in NVRAM, however, you can overwrite an S-Register's stored value.

Displaying S-Register Settings

To display S-Register settings, use the following commands:

To display	Command
S-Register help	ATS$
S-Register settings in the Flash template	ATI5
Current S-Register settings	ATI4
One S-Register	ATS<S-Register number>?Example: ATS19?

If you change an S-Register setting and want to save the change, follow the setting with &W. If you do not follow an S-Register setting with &W, the setting is retained only until the next reboot or power off.

Changing an S-Register

To change a setting for an S-Register in the current configuration, use the following commands:

To set the S-Register value using	Command	Example
Decimal numbers (3Com recommends this option)	ATSr=n, where r is an S-Register and n is a decimal number between 0 and 255	ATS50=2
Bit-mapped registers	ATSr.b=n, where r is the bit-mapped S-register, b is the bit (0-7), and n is 0 or 1 (off or on)	ATS89.1=1

F

MODEM HELP COMMANDS

This appendix contains information about the following command sets:

- Basic AT ($)
- Advanced AT (&$)
- S-Register (S$)
- Percent (%$)
- Asterisk (*$)

Basic AT Commands

When you enter AT$, HiPer DSP displays a partial summary of the basic AT command set. See the table below.

Command	Function
&$	HELP, Ampersand Commands
%$	HELP, Percent Commands
*$	HELP, Asterisk Commands
A/	Repeat Last Command
AT	Command Mode Prefix
A	Answer Call
Dn	Dial a Telephone Number n=0..9#*TP,;"W!()-
DL	Dial Last Phone Number
DSn	Dial Stored Phone Number
D$	HELP, Dial Commands
En	n=0 No Command Echo n=1 Echo Command Chars
Hn	n=0 On Hook (Hang Up) n=1 Off Hook

Command	Function
&$	HELP, Ampersand Commands
Qn	n=0 Result Codes Sent
	n=1 Quiet (No Result Codes)
	n=2 Verbose/Quiet On Answer
Sr=n	Sets Register "r" to "n"
Sr?	Query Register "r"
S$	HELP, S Registers
T	Tone Dial
Vn	n=0 Numeric Responses
	n=1 Verbal Responses
Xn	n=0 Basic Result Codes
	n=1 Extended Result Codes
	n=2-7 Advanced Result Codes
Z	Software Reset
$	HELP, Command Summary
In	n=1 Checksum
	n=3 Call Duration
	n=4 Current Settings
	n=5 Flash Settings
	n=6 Link Diagnostics
	n=7 Product Configuration
	n=9 DNIS Configuration
	n=11 Extended link screen

Advanced AT Commands

When you enter AT&$, HiPer DSP displays a partial summary of the ampersand command set. Press any key to view the remaining Advanced Help commands. Below is a table of those commands.

Command	Function
&An	n=0 Disable /ARQ Result Codes
	n=1 Enable /ARQ Result Codes
	n=2 Enable /Modulation Codes
	n=3 Enable /Extra Result Codes

Command	Function
&Fn	n=0 Load Factory Configuration
&Gn	n=0 No Guard Tone
	n=1 550 Hz Guard Tone
	n=2 1800 Hz Guard Tone
&Kn	n=0 Disable Data Compression
	n=1 Auto Data Compression
	n=2 Enable Data Compression
	n=3 Selective Data Compression
&Mn	n=0 Normal Mode
	n=4 ARQ/Normal Mode
	n=5 ARQ Mode
&Nn	n=0 Highest Link Speed
	n=1 300 bps n=23 36000 bps
	n=2 1200 bps n=24 37333 bps
	n=3 2400 bps n=25 38666 bps
	n=4 4800 bps n=26 40000 bps
	n=5 7200 bps n=27 41333 bps
	n=6 9600 bps n=28 42666 bps
	n=7 12000 bps n=29 44000 bps
	n=8 14400 bps n=30 45333 bps
	n=9 16800 bps n=31 46666 bps
	n=10 19200 bps n=32 48000 bps
	n=11 21600 bps n=33 49333 bps
	n=12 24000 bps n=34 50666 bps
	n=13 26400 bps n=35 52000 bps
	n=14 28800 bps n=36 53333 bps
	n=15 31200 bps n=37 54666 bps
	n=16 33600 bps n=38 56000 bps
	n=17 28000 bps n=39 57333 bps
	n=18 29333 bps n=40 58666 bps
	n=19 30666 bps n=41 60000 bps
	n=20 32000 bps n=42 61333 bps
	n=21 33333 bps n=43 62666 bps

Command	Function
&Tn	n=0 End Test n=1 Analog Loopback (ALB)
&U	Minimum link speed (see &N)
&W	Store Configuration
&Zn=s	Store Phone Number
&Zn=L	Store Last Phone Number
&Zn?	Query Phone Number

S-Register Commands

When you enter ATS$, HiPer DSP displays a partial summary of the S-Register functions. Press any key to view the remaining S-Register Help commands.

To view a complete list of the S-Registers, including the S-Register defaults and functions, see Appendix E, AT Commands at a Glance.

Other Help Commands

Percent Command Set

When you enter AT%$, HiPer DSP displays the following:

```
mdm1> at%$

HELP, Modem Percent Commands
%Bn   Store V110 Rate.
   n=0  300 bps
   n=1  300 bps
   n=2  600 bps
   n=3  1200 bps
   n=4  2400 bps
   n=5  4800 bps
   n=6  9600 bps
   n=7  19200 bps
   n=8  38400 bps
   n=9  38400 bps
   n=10 38400 bps
%CIn=s Store Initialization String. n=1-4
%CNn=s Store DNIS Number. n=1-3
```

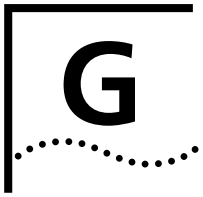
Asterisk Command Set

When you enter AT*$, HiPer DSP displays the following:

```
mdm1> at*$

HELP, Modem Asterisk Commands
*U1=n      Originate Mode HDLC Protocol Selection
            n=0 None
            n=1 V.120
            n=2 X.75
            n=3 Async-to-Sync PPP
*U2=n      Originate Mode Non-HDLC Protocol Selection
            n=0 None
            n=1 V.110
*U3=n      Originate Mode Analog Modem/Fax Selection
            n=0 None
            n=1 Analog Modem/Fax
*V2=n      Originate/Answer Mode Protocol Selection
            n=0 Auto Detect
            n=1 V.120 Rate Adaption only
            n=2 V.110 Rate Adaptation only
            n=3 Modem/Fax Emulation only
            n=4 Clear Channel only
            n=5 Async-to-Sync PPP only
            n=6 X.75 only

*X0=n     X.75 Frame size in bytes
            n=1 minimum
              :
            n=2048 maximum
*X1=n     X.75 Window size in frames
            n=1 minimum
              :
            n=7 maximum
```



MODEM SETTINGS

This appendix contains:

- Call duration
- Modem settings

Accessing the Modem Settings

Access the modem settings at the modem prompt.

```
>
>chdev mdm
mdm>
```

Displaying Call Duration

Enter ATI3 to display call duration settings.

```
mdm1> ati3

00:00:00

OK
```

Displaying Current Modem Settings

Enter ATI4 to display current modem settings.

```
mdm1> ati4

Modem Current Settings

   E0  Q0  V1  X1
   &A1  &G0  &K1  &M4  &N0  &U0  %B7
   *U1=1  *U2=0  *U3=1  *V2=0  *X0=2048  *X1=2


S00=001  S01=000  S02=043  S03=013  S04=010  S05=008  S06=002
S07=060  S08=002  S09=006  S10=007  S11=070  S12=050  S13=000
```

```
S14=001  S15=000 S16=000 S17=000 S18=000 S19=000 S20=000
S21=000  S22=000 S23=000 S24=000 S25=000 S26=000 S27=000
S28=008  S29=020 S30=000 S31=000 S24=000 S25=000 S26=000
S27=000  S28=008 S29=020 S30=000 S31=000 S40=000 S41=000
S42=000  S43=000 S44=000 S45=000 S46=000 S47=000 S48=000
S49=016  S50=100 S51=064 S52=005 S53=000 S54=064 S55=000
S56=000  S57=000 S58=000 S59=000 S60=000 S61=000 S62=000
S63=000  S64=000 S65=000 S66=000 S67=000 S68=000 S69=000
S70=000  S71=000 S72=000 S73=001 S74=000 S75=000 S76=000
S77=000  S78=000 S79=000 S80=000 S81=000 S82=012

   Last Dialed #:
```

Displaying Modem Flash Settings

Enter ATI5 to display modem flash settings.

```
mdm1> ati5

Modem Flash Settings

   E0  Q0  V1  X1
   &A1  &G0  &K1  &M4  &N0  &U0  %B7
   *U1=1  *U2=0  *U3=1  *V2=0  *X0=2048  *X1=2

S00=001  S01=000 S02=043 S03=013 S04=010 S05=008 S06=002
S07=060  S08=002 S09=006 S10=007 S11=070 S12=050 S13=000
S14=001  S15=000 S16=000 S17=000 S18=000 S19=000 S20=000
S21=000  S22=000 S23=000 S24=000 S25=000 S26=000 S27=000
S28=008  S29=020 S30=000 S31=000 S32=000 S33=000 S34=000
S35=000  S36=000 S37=000 S38=000 S39=011 S40=000 S41=000
S42=000  S43=000 S44=000 S45=000 S46=000 S47=000 S48=000
S49=016  S50=100 S51=064 S52=005 S53=000 S54=064 S55=000
S56=000  S57=000 S58=000 S59=000 S60=000 S61=000 S62=000
S63=000  S64=000 S65=000 S66=000 S67=000 S68=000 S69=000
S70=000  S71=000 S72=000 S73=001 S74=000 S75=000 S76=000
S77=000  S78=000 S79=000 S80=000 S81=000 S82=012

  STORED PHONE #0:
```

```
  STORED PHONE #1:
  STORED PHONE #2:
  STORED PHONE #3:
```

Displaying Link Diagnostics of the Current or Previous Call

Enter ATI6 to display link diagnostics of the current or previous call.

```
mdm1> ati5

Modem Flash Settings

   E0  Q0  V1  X1
   &A1  &G0  &K1  &M4  &N0  &U0  %B7
   *U1=1  *U2=0  *U3=1  *V2=0  *X0=2048  *X1=2

S00=001 S01=000 S02=043 S03=013 S04=010 S05=008 S06=002
S07=060 S08=002 S09=006 S10=007 S11=070 S12=050 S13=000
S14=001 S15=000 S16=000 S17=000 S18=000 S19=000 S20=000
S21=000 S22=000 S23=000 S24=000 S25=000 S26=000 S27=000
S28=008 S29=020 S30=000 S31=000 S32=000 S33=000 S34=000
S35=000 S36=000 S37=000 S38=000 S39=011 S40=000 S41=000
S42=000 S43=000 S44=000 S45=000 S46=000 S47=000 S48=000
S49=016 S50=100 S51=064 S52=005 S53=000 S54=064 S55=000
S56=000 S57=000 S58=000 S59=000 S60=000 S61=000 S62=000
S63=000 S64=000 S65=000 S66=000 S67=000 S68=000 S69=000
S70=000 S71=000 S72=000 S73=001 S74=000 S75=000 S76=000
S77=000 S78=000 S79=000 S80=000 S81=000 S82=012


  STORED PHONE #0:
  STORED PHONE #1:
  STORED PHONE #2:
  STORED PHONE #3:
```

Displaying Product Configuration

Enter ATI7 to display product configuration.

```
mdm1> ati7
Modem Configuration Profile

Product Type              US/Canada Rackmount
Serial Number             123456789ABC
```

```
Slot/Channel              2/1
Modem Options             V.32, V.34+, x2
ISDN Options              V.110, V.120, X.75, Sync PPP
Cellular Options          None
Fax Options               None
Span Options              PRI/T1, CHT1
Channel Capacity          24
RISC Clock Frequency      60MHz
DSP Clock Frequency       75MHz
Board Manager Flash ROM   2Mb
Board Manager RAM         8Mb

Boot Block Date           09/11/97
Board Manager Date        09/11/97
ACP Date                  09/11/97
DSP Date                  09/11/97

Boot Block Revision       0.0.0
Board Manager Revision    1.0.4
ACP Revision              1.0.4
DSP Revision              1.0.4


OK
```

Displaying Standard Feature Group B Settings

Enter ATI9 to display standard Feature Group B settings.

```
mdm1> ati9
Modem DNIS Initialization Settings

   #          DNIS                 Call Initialization String

          |----------|
|---------------------------------------|
  1
  2
  3
  4      (unknown)


OK
```

Displaying Advanced Link Diagnostics

Enter ATI11 to display advanced link diagnostics.

```
mdm1> ati11

DSP Link Diagnostics...
Modulation (recv/xmit)    NO_CONN
Carrier Freq    ( Hz )    0/0
Symbol Rate               0/0
Trellis Code
Nonlinear Encoding
Precoding
Shaping
Preemphasis     (-dB )
Recv/Xmit Level (-dBm)    0.0/0.0
SNR             ( dB )
Near Echo       ( dB )
Far Echo        ( dB )
Roundtrip Delay (msec)
Timing Offset   ( ppm)
Carrier Offset  ( ppm)
x2 Status                 x2 not operational
x2 Signature              0000-0000-0000


OK
```

H

SPAN LINE DISPLAY COMMANDS

Use this appendix to view:

- Span line settings
- A comprehensive list of the span line display commands
- Sample outputs of the span line display commands

Display Commands

display ancbec

```
span1> display ancbec

[uds1CfgAnlgBlockErrCode]
   Span1 Analog Calls Blocked Error Code is:  58
```

display absig

```
span1/tslot1> display absig

          2   M   0000
       2740   E   0000
```

display achannel

```
span1/tslot1> display achannel

    Where Values for Assigned Channel
[ds0CfgDs0AssignedChannel] are:
       1-24 = Assigned Channel
       33   = Unrestricted

[ds0CfgDs0AssignedChannel]
   Span1 Timeslot1 Assigned Channel is:  1
```

display atconfig

```
span1> display atconfig

Tslot   Block    Assigned   Service  ID Description
      Call Type   Chan       State
 01       NONE     01          IS
 02       NONE     02          IS
 03       NONE     03          IS
 04       NONE     04          IS
 05       NONE     05          IS
 06       NONE     06          IS
 07       NONE     07          IS
 08       NONE     08          IS
 09       NONE     09          IS
 10       NONE     10          IS
 11       NONE     11          IS
 12       NONE     12          IS
 13       NONE     13          IS
 14       NONE     14          IS
 15       NONE     15          IS
 16       NONE     16          IS
 17       NONE     17          IS
 18       NONE     18          IS
 19       NONE     19          IS
 20       NONE     20          IS
 21       NONE     21          IS
 22       NONE     22          IS
 23       NONE     23          IS
 24       NONE     24          IS
```

display atproto

```
span1> display atproto

Tslot  Status   Modem    Protocol
                Connect
 01      Idle    001
 02      Idle    002
 03      Idle    003
 04      Idle    004
 05      Idle    005
 06      Idle    006
 07      Idle    007
 08      Idle    008
 09      Idle    009
 10      Idle    010
 11      Idle    011
 12      Idle    012
 13      Idle    013
 14      Idle    014
 15      Idle    015
 16      Idle    016
 17      Idle    017
 18      Idle    018
 19      Idle    019
 20      Idle    020
 21      Idle    021
 22      Idle    022
 23      Idle    023
 24     Dchan    N/A    HST
```

display atstat

```
span1> display atstat

Tslot  Status   Modem    Status        Call ID        Action    Q931
               Connect Srvc State                     Queued    Ref
 01      Idle    001          IS      0x00000000       None    0x00000000
 02      Idle    002          IS      0x00000000       None    0x00000000
 03      Idle    003          IS      0x00000000       None    0x00000000
 04      Idle    004          IS      0x00000000       None    0x00000000
 05      Idle    005          IS      0x00000000       None    0x00000000
 06      Idle    006          IS      0x00000000       None    0x00000000
 07      Idle    007          IS      0x00000000       None    0x00000000
 08      Idle    008          IS      0x00000000       None    0x00000000
 09      Idle    009          IS      0x00000000       None    0x00000000
 10      Idle    010          IS      0x00000000       None    0x00000000
 11      Idle    011          IS      0x00000000       None    0x00000000
```

```
12      Idle    012          IS      0x00000000        None    0x00000000
13      Idle    013          IS      0x00000000        None    0x00000000
14      Idle    014          IS      0x00000000        None    0x00000000
15      Idle    015          IS      0x00000000        None    0x00000000
16      Idle    016          IS      0x00000000        None    0x00000000
17      Idle    017          IS      0x00000000        None    0x00000000
18      Idle    018          IS      0x00000000        None    0x00000000
19      Idle    019          IS      0x00000000        None    0x00000000
20      Idle    020          IS      0x00000000        None    0x00000000
21      Idle    021          IS      0x00000000        None    0x00000000
22      Idle    022          IS      0x00000000        None    0x00000000
23      Idle    023          IS      0x00000000        None    0x00000000
24     Dchan    N/A          IS      0x00000000        None    0x00000000
```

display blcaltyp

```
span1> display blcaltyp

[uds1CfgBlockCallType]
   Span1 Block Call Type is:  BLOCK NONE [blockNone]
```

display ccrcfig

```
span1> display ccrcfig

[dsx1SignalMode]
  Span1 Configured Signal Mode is (sigmode): MESSAGE ORIENTED
[messageOriented]
[udsx1SignalModeActive]
   Span1 Signal Mode Active is:              MESSAGE ORIENTED
[messageOriented]
[uds1CfgDialInAdr]
  Span1 DNIS Enable is (dnisena):            DNIS ADDRESS
[dnis]
[uds1CfgDialInOutTrunkSt]
  Span1 Dial In Out Trunk Start (diotrst): . WINK [wink]
[uds1CfgDialInAdrAckWinkEn]
  Span1 Dial In Address ACK Wink (daackwnk): ACK WINK
DISABLED [disabled]
[uds1CfgDialOutAdrDly]
  Span1 Dial Out Address Delay (doadrdly):   70 milliseconds
[uds1CfgDialInOutTrunkType]
  Span1 Dial In Out Trunk Type (dtrnktyp): . E&M TYPE II
[eAndMTypeII]
[uds1CfgPriSwitchType]
  Span1 Configured Switch Type is (swtype):  5ESS [priSw5ESS]
[uds1StatSwitchTypeActive]
```

```
   Span1 Switch Type Active is:              5ESS [priSw5ESS]
[uds1CfgIdleByte]
  Span1 Idle Byte is (idlebyte):             0xFE
[uds1CfgAnlgBlockErrCode]
  Span1 Ana Calls Blocked Err Code (ancbec): 58
[uds1CfgDgtlBlockErrCode]
  Span1 Digi Calls Blocked Err Code (dcbec): 58
[uds1CfgNoIgwsAvailErrCode]
  Span1 No IGWS Avail Err Code (noigwsav):   58
[uds1CfgChanBlockErrCode]
  Span1 Chan Blocked Err Code (chanblck): .. 58
[uds1CfgBlockCallType]
  Span1 Block Call Type is (blcaltyp):       BLOCK NONE
[blockNone]
[ds1ToneType]
  Span1 Tone Type is (tonetype):             DTMF TONE [dtmf]
[ds1NumDtmfTones]
  Span1 Number Of DTMF Tones is (numdtmft):  4
[chT1E1DialOutSelectDirection]
  Span1 Dial Out Select Direction (dseldir): DOWN [down]
[chT1E1DialOutNextDS0]
  Span1 Dial Out Next Timeslot (dntslot): .. 24
[uds1CfgChtProfile]
  Span1 Channelized T1 Profile (cprofile):   E&M TYPE II
GENERIC PROFILE
[eAndMTypeIIGeneric]
display chanblck
span1> display chanblck

[uds1CfgChanBlockErrCode]
   Span1 ChannelBlockedErrCode is:  58
```

display contcrc

```
span1> display contcrc

[uds1StatE1ContCrc]
   Span1 Continuous CRC Error is:  FALSE [false]
```

display cprofile

```
span1> display cprofile

[uds1CfgChtProfile]
   Span1 Channelized T1 Profile is:  E&M TYPE II GENERIC
PROFILE
[eAndMTypeIIGeneric]
```

display crgain

```
span1> display crgain

[uds1CfgRcvGain]
   Span1 Configured Receiver Gain is:  26.0 DB GAIN [dB26]
display d-chanop
span1> display chanop
usage: display Span_Param/Stat
 where Span_Param/Stat is one of the following:
  ancbec   - Displays Analog Calls Blocked Error Code
[uds1CfgAnlgBlockErrCode]
  atabsig  - Displays list of AB signaling for each timeslot
  atconfig - Displays list of configurables for each timeslot
  atprotoc - Displays list of status with modem protocol for
each timeslot
  atstat   - Displays list of statistics for each timeslot
  blcaltyp - Displays span line block call type
[uds1CfgBlockCallType]
  calltype - Displays phone number call
type[CrInboundPhNum;CrInboundCallType]
  ccrcfig  - Displays call control related configurables
  chanblck - Displays channel blocked error code
[uds1CfgChanBlockErrCode]
  contcrc  - Displays continuous CRC errors
[uds1StatE1ContCrc]
  cprofile - Displays CHT1 profile [uds1CfgChtProfile]
  crgain   - Displays configured receiver gain
[uds1CfgRcvGain]
  csttpsel - Displays call stats group selection
[LogCallStatGrpSel]
  d-chanop - Displays D-channel operational
[uds1StatDchanOperational]
  daackwnk - Displays dial in addr ACK wink
[uds1CfgDialInAdrAckWinkEn]
  dcbec    - Displays Digital Calls Blocked Error Code
[uds1CfgDgtlBlockErrCode]
  diotrst  - Displays dial in out trunk start
[uds1CfgDialInOutTrunkSt]
  dnisena  - Displays DNIS enable [uds1CfgDialInAdr]
```

display daackwnk

```
span1> display daackwnk

[uds1CfgDialInAdrAckWinkEn]
   Span1 Dial In Address ACK Wink is:  ACK WINK DISABLED
[disabled]
```

display dcbec

```
span1> display dcbec

[uds1CfgDgtlBlockErrCode]
   Span1 Digital Calls Blocked Error Code is:  58
```

display diotrst

```
span1> display diotrst

[uds1CfgDialInOutTrunkSt]
   Span1 Dial In Out Trunk Start is:  WINK [wink]
```

display dnisena

```
span1> display dnisena

[uds1CfgDialInAdr]
   Span1 DNIS Enable is:  DNIS ADDRESS [dnis]
```

display dntslot

```
span1> display dntslot

[chT1E1DialOutNextDS0]
   Span1 Dial Out Next Timeslot is:  24
```

display doadrdly

```
span1> display doadrdly

[uds1CfgDialOutAdrDly]
   Span1 Dial Out Address Delay is:  70 milliseconds
```

display dseldir

```
span1> display dseldir

[chT1E1DialOutSelectDirection]

   Span1 Dial Out Select Direction is:  DOWN [down]
```

display dtrnktyp

```
span1> display drtrnktyp

[uds1CfgDialInOutTrunkType]
   Span1 Dial In Out Trunk Type is:  E&M TYPE II [eAndMTypeII]
```

display fdl

```
span1> display fdl

[dsx1Fdl]
   Span1 Facilities Data Link is:
   [dsx1Fdl-none]
      FDL NONE    = TRUE
```

display iddesrc

```
span1/tslot1> display iddescr

[ds0CfgDs0Id]
   Span1 Timeslot1 ID Description is:
```

display idlebyte

```
span1> display idlebyte

[uds1CfgIdleByte]
   Span1 Idle Byte is:  0xFE
```

display jittaten

```
span1> display jittanten

[uds1CfgJitterAttenuation]
   Span1 Jitter Attenuation is:  ATTENUATE TRANSMITTER JITTER
[attenJitterOnTxmtr]
```

display lcoding

```
span1> di lcoding

[dsx1LineCoding]
   Span1 Line Coding is:  B8ZS - Binary Eight Zero Code
Suppression
[dsx1B8ZS]
```

display liorig

```
span1> di liorig

[uds1StatLoopBackInit]
   Span1 Loopback Init Originate is:  NONE [none]
```

display loconfig

```
span1> di loconfig

[dsx1LoopbackConfig]
   Span1 dsx1 Loopback Configuration is:  NO LOOP
[dsx1NoLoop]
```

display lstatus

```
span1> di lstatus

[dsx1LineStatus]
   Span1 Line Status is:
      [dsx1NoAlarm] NO ALARM               = TRUE
      [dsx1RcvFarEndLOF] RCV FAR END LOF   = FALSE
      [dsx1XmtFarEndLOF] XMT FAR END LOF   = FALSE
      [dsx1RcvAIS] RCV AIS                 = FALSE
```

```
[dsx1XmtAIS] XMT AIS                 = FALSE
[dsx1LossOfFrame] OUT OF FRAME       = FALSE
[dsx1LossOfSignal] LOSS OF SIGNAL    = FALSE
[dsx1LoopbackState] LOOPBACK STATE   = FALSE
[dsx1T16AIS] T16 AIS                 = FALSE
[dsx1RcvFarEndLOMF] RCV FAR END LOMF = FALSE
[dsx1XmtFarEndLOMF] XMT FAR END LOMF = FALSE
[dsx1RcvTestCode] RCV TEST CODE      = FALSE
[dsx1OtherFailure] OTHER FAILURE     = FALSE
```

display ltype

```
span1> di ltype

[dsx1LineType]
   Span1 Line Type is:  ESF [dsx1ESF]
```

display mdmrmeth

```
span1> di mdmrmeth

[CfgMdmRoutingMethod]
   Span1 Modem Routing Method is:  FIXED ASSIGNMENT
[fixedAssignment]
```

display near

```
span1> di near
usage: display near Stat_Type

  where Stat_TYPE is one of the following:
    current  - Near end current span stats
    total    - Near end total span stats
    interval - Near end interval span stats
```

display noigwsav

```
span1> di noigwsav

[uds1CfgNoIgwsAvailErrCode]
   Span1 No IGWS Available Error Code is:  58
```

display ntimlaps

```
span1> di ntimplaps

[dsx1TimeElapsed]
   Span1 Near Time Elapsed is:  86 seconds
```

display numdtmft

```
span1> di numdtmft

[ds1NumDtmfTones]
```

```
   Span1 Number Of DTMF Tones is:  4
```

display nvalint

```
span1> di nvalint

[dsx1ValidIntervals]
   Span1 Near Valid Intervals is:  96
```

display physst

```
span1> di physst

[uds1StatE1PhysicalState]
   Span1 Physical State is:  F1 OPERATIONAL [psF1Operational]
```

display rilpback

```
span1> di rilpback

[uds1CfgRespToRemoteLoopbk]
   Span1 Remotely Init Loopback is:  IGNORE [ignore]
```

display rxgain

```
span1> di rxgain

[uds1StatReceiverGain]
   Span1 Receiver Gain is:  0.0 DB GAIN [dB0]
```

display sendcode

```
span1> di sendcode

[dsx1SendCode]
   Span1 Send Code is:  SEND NO CODE [dsx1SendNoCode]
```

display shauldis

```
span1> di shauldis

[uds1ShrtHaulDist]
   Span1 Short Haul Distance is:  0 TO 133 feet
[len0thru133Ft]
```

display sigmode

```
span1> di sigmode

[dsx1SignalMode]
   Span1 Signal Mode is:  MESSAGE ORIENTED [messageOriented]
```

display smactive

```
span1> di smactive

[udsx1SignalModeActive]
```

```
   Span1 Signal Mode Active is:  MESSAGE ORIENTED
[messageOriented]
```

display spnstats

```
span1> di spnstats

[dsx1TimeElapsed]
   Span1 Near Time Elapsed is:               189 seconds
[dsx1ValidIntervals]
   Span1 Near Valid Intervals is:            96
[dsx1LineStatus]
   Span1 Line Status is:
      [dsx1NoAlarm] NO ALARM               = TRUE
      [dsx1RcvFarEndLOF] RCV FAR END LOF   = FALSE
      [dsx1XmtFarEndLOF] XMT FAR END LOF   = FALSE
      [dsx1RcvAIS] RCV AIS                 = FALSE
      [dsx1XmtAIS] XMT AIS                 = FALSE
      [dsx1LossOfFrame] OUT OF FRAME       = FALSE
      [dsx1LossOfSignal] LOSS OF SIGNAL    = FALSE
      [dsx1LoopbackState] LOOPBACK STATE   = FALSE
      [dsx1T16AIS] T16 AIS                 = FALSE
      [dsx1RcvFarEndLOMF] RCV FAR END LOMF = FALSE
      [dsx1XmtFarEndLOMF] XMT FAR END LOMF = FALSE
      [dsx1RcvTestCode] RCV TEST CODE      = FALSE
      [dsx1OtherFailure] OTHER FAILURE     = FALSE
[dsx1SendCode]
   Span1 Send Code is:                       SEND NO CODE
[dsx1SendNoCode]
[dsx1LoopbackConfig]
   Span1 dsx1 Loopback Configuration is:     NO LOOP
[dsx1NoLoop]
[uds1StatReceiverGain]
   Span1 Receiver Gain is: ................. 0.0 DB GAIN
[dB0]
[uds1StatE1ContCrc]
   Span1 Continuous CRC Error is:            FALSE [false]
[uds1StatE1PhysicalState]
   Span1 Physical State is:                  F1 OPERATIONAL
[psF1Operational]
[uds1StatLoopBackInit]
   Span1 Loopback Init Originate is: ........ NONE [none]
[modemNotAvailable]
   Span1 Modem Not Available Count is:        0
[inCallInvalidBearerCapa]
   Span1 Invalid Bearer Capability Count is:  0
[inCallInvalidChannelID]
```

```
   Span1 Invalid Channel ID Count is: ....... 0
[inCallInvalidProgressInd]
   Span1 Invalid Progress Indicator Count is: 0
[inCallInvalidCallingParty]
   Span1 Invalid Calling Party Count is:      0
[inCallInvalidCalledParty]
   Span1 Invalid Called Party Count is: ..... 0
[inCallCallBlock]
   Span1 Call Block Failure Count is:         0
[inCallLoopStartNoRingOff]
   Span1 No Ring Off Failure Count is:        0
[outCallTelcoDisconnect]
   Span1 Telco Disconnect Failure Count is: . 0
[outCallEMWinkTimeOut]
   Span1 TELCO Failed To Wink Count is:       0
[outCallEMWinkTooShort]
   Span1 TELCO Wink Too Short Count is:       0
[outCallNoChannelAvail]
   Span1 No Channel Available Count is: ..... 0
[discNoTelcoRespDialIn]
   Span1 Dial In No Resp To Disc Count is:    0
[discNoTelcoRespDialOut]
   Span1 Dial Out No Resp To Disc Count is:   0
[discNoTelcoRespGround]
   Span1 Gnd Start No Resp To Disc Count is:  0
[uds1StatSwitchTypeActive]
   Span1 Switch Type Active is:              5ESS [priSw5ESS]
[uds1StatDchanOperational]
   Span1 D-channel Operational is:           UP [dChannelUp]
[udsx1SignalModeActive]
   Span1 Signal Mode Active is:              MESSAGE ORIENTED
[messageOriented]
```

display srconfig

```
span1> di srconfig

[dsx1TransmitClockSource]
   Span1 Transmit Clock Source (txclksrc):  LOOP TIMING
[loopTiming]
[dsx1Fdl]
   Span1 Facilities Data Link is (fdl):
            [dsx1Fdl-none]    FDL NONE    = TRUE
[dsx1LineType]
   Span1 Line Type is (ltype): ............ ESF [dsx1ESF]
[dsx1LineCoding]
```

```
   Span1 Line Coding is (lcoding):          B8ZS - Binary
Eight Zero Code
Suppression [dsx1B8ZS]
[uds1CfgRespToRemoteLoopbk]
   Span1 Remotely Init Loopback (rilpback): IGNORE [ignore]
[uds1CfgJitterAttenuation]
   Span1 Jitter Attenuation is (jittaten):  ATTENUATE TXMTR
JITTER
[attenJitterOnTxmtr]
[dsx1NicCfgType]
   Span1 NIC Config Type is (nicfgtyp):     LONG HAUL
[longHaul]
[uds1CfgXmitLineBuildOut]
   Span1 Transmit Line Build Out (txlibo):  0.0 DB [dB0]
[uds1ShrtHaulDist]
   Span1 Short Haul Distance (shauldis): .. 0 TO 133 feet
[len0thru133Ft]
[uds1CfgRcvGain]
   Span1 Configured Receiver Gain (crgain): 26.0 DB GAIN
[dB26]
```

display sstate

```
span1/tslot1> display sstate

[ds0CfgDs0SrvcState]
   Span1 Timeslot1 Service State is:  IN SERVICE [inService]
```

display stactive

```
span1> di stactive

[uds1StatSwitchTypeActive]
   Span1 Switch Type Active is:  5ESS [priSw5ESS]
```

display swtype

```
span1> di swtype

[uds1CfgPriSwitchType]
   Span1 Switch Type is:  5ESS [priSw5ESS]
```

display tconfig

```
span1/tslot1> display tconfig

[ds0CfgDs0Id]
   Span1 Tslot1 ID Description is (iddescr):
[ds0CfgBlockCallType]
   Span1 Tslot1 Block Call Type (bcalltyp):  BLOCK NONE
[blockNone]
[ds0CfgDs0AssignedChannel]
```

```
   Span1 Tslot1 Assigned Channel (achannel): 0

    Where Values for Assigned Channel
[ds0CfgDs0AssignedChannel] are:
       1-24 = Assigned Channel
       33   = Unrestricted

[ds0CfgDs0SrvcState]
   Span1 Tslot1 Service State is (sstate):   IN SERVICE
[inService]
```

display tonetype

```
span1> di tonetype

[ds1ToneType]
   Span1 Tone Type is:  DTMF TONE [dtmf]
```

display traps

```
span1> di traps

[uds1TrapEnaDs0InSrvc]
   Span1 Trap Timeslot Service State (IS) is:
DISABLE_ALL [disableAll]
[uds1TrapEnaDs0OutOfSrvc]
   Span1 Trap Timeslot Service State (OOS) is:
DISABLE_ALL [disableAll]
[uds1TrapEnaDs0ServStateMt]
   Span1 Trap Timeslot Service State (MAINT) is:
DISABLE_ALL [disableAll]
[telcoAbnornalRspTrapEna]
   Span1 Trap Abnormal Response from TELCO is:
DISABLE_ALL [disableAll]
[uds1TrapEnaDs0InConnFail]
   Span1 Trap Incoming call Fail DS0 level is:
DISABLE_ALL [disableAll]
[uds1TrapEnaDs0OutConnFail]
   Span1 Trap Outgoing call Fail DS0 level is:
DISABLE_ALL [disableAll]
[uds1TrapEnaYellowAlarm]
   Span1 Trap Yellow Alarm Condition is:
DISABLE_ALL [disableAll]

[uds1TrapEnaRedAlarm]
   Span1 Trap Red Alarm Condition is:             DISABLE_ALL
[disableAll]
[uds1TrapEnaLossOfSignal]
```

```
   Span1 Trap Loss Of Signal Condition is:
DISABLE_ALL [disableAll]
[uds1TrapEnaAlarmIndSignal]
   Span1 Trap Alarm Indication Signal Condition is:
DISABLE_ALL [disableAll]
[uds1TrapEnaYellowAlarmClr]
   Span1 Trap Yellow Alarm Clear Condition is:
DISABLE_ALL [disableAll]
[uds1TrapEnaRedAlarmClr]
   Span1 Trap Red Alarm Clear Condition is:
DISABLE_ALL [disableAll]
[uds1TrapEnaLossOfSgnlClr]
   Span1 Trap Loss Of Signal Clear Condition is:
DISABLE_ALL [disableAll]
[uds1TrapEnaAlrmIndSgnlClr]
   Span1 Trap Alarm Ind. Signal Clear Condition is:
DISABLE_ALL [disableAll]
[uds1TrapEnaContCrcAlrm]
   Span1 Trap Continuous CRC Alarm Condition is:
DISABLE_ALL [disableAll]
[uds1TrapEnaContCrcAlrmClr]
   Span1 Trap Cont. CRC Alarm Clear Condition is:
DISABLE_ALL [disableAll]
[uds1TrapEnaPhysStateChng]
   Span1 Trap Physical State Change Condition is:
DISABLE_ALL [disableAll]
[loopBackTrapEna]
  Span1 Trap Loop Back Condition is:             DISABLE_ALL
[disableAll]
[loopBackClearedTrapEna]
   Span1 Trap Loop Back Cleared Condition is:
DISABLE_ALL [disableAll]
```

display tsstat

```
span1/tslot1> display tsstat

[callID]
   Tslot1 Call ID is:              0x00000000
[ds0ActionQueued]
   Tslot1 Action Queued is:        NO ACTION QUEUED [none]
[ds0StatDs0]
   Tslot1 Status is:               IDLE [idle]
[ds0StatChanConnTo]
   Tslot1 Channel Connected TO is: N/A
[ds0StatDs0SrvcState]
   Tslot1 Status Service State is: IN SERVICE [inService]
```

```
[ds0StatCallEventQ931Value]
   Tslot1 Q931 Call Ref Value is:  0x00000000
```

display txclksrc

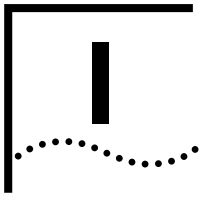
```
span1> di txclksrc

[dsx1TransmitClockSource]
   Span1 Transmit Clock Source is:  LOOP TIMING [loopTiming]
```

display txlibo

```
span1> di txlibo

[uds1CfgXmitLineBuildOut]
   Span1 Transmit Line Build Out is:  0.0 DB [dB0]
```



Result Codes

This appendix contains:

- HiPer DSP result codes
- Result codes not supported by HiPer DSP

Result Codes

The following result codes are supported by HiPer DSP:

Message	#	Message	#
NO DIAL TONE	6	14400/ARQ	26
BUSY	7	4800/HST	28
NO ANSWER	8	9600/ARQ/V32	37
NO ANSWER	9	4800/V32	38
2400	10	4800/ARQ/V32	39
RINGING	11	7200/V32	40
VOICE	12	12000/V32	41
9600	13	12000/ARQ/V32	42
CONNECT/ARQ	14	16800	43
1200/ARQ	15	7200/ARQ/V32	44
2400/ARQ	16	14400/V32	45
9600/ARQ	17	14400/ARQ/V32	46
4800	18	16800/ARQ	47
4800/ARQ	19	75/1200	48
7200	20	1200/75	49
12000	21	ABORT	50
12000/ARQ	22	INCOMING CALL	51
7200/ARQ	24	PHONE OFF HOOK	52
14400	25	OFF HOOK RESTRICTED	54
16800/ARQ/HST	57	26400	103

Message	#	Message	#
COMMAND DENIED	58	26400/ARQ	104
WAITING	61	26400/VFC	105
DIALING DIABLED	62	26400/ARQ/VFC	106
DATA	63	28800	107
+FCO	65	28800/ARQ	108
16800/V32	83	28800/VFC	109
16800/ARQ/V32	84	28800/ARQ/VFC	110
19200	85	21600/V34	111
19200/V32	87	21600/ARQ/V34	112
19200/ARQ	88	24000/V34	113
19200/ARQ/V32	90	24000/ARQ/V34	114
21600	91	26400/V34	115
21600/V32	93	26400/ARQ/V34	116
21600/ARQ	94	28800/V34	117
21600/ARQ/V32	96	28800/ARQ/V34	118
21600/VFC	97	2400/VFC	119
21600/ARQ/VFC	98	2400/V34	120
24000	99	2400/ARQ/VFC	121
24000/ARQ	100	2400/ARQ/V34	122
24000/VFC	101	4800/V34	124
24000/ARQ/VFC	102	4800/ARQ/VFC	125
4800/ARQ/V34	126	56000 (ISDN)	162
7200/VFC	127	56000/ARQ (ISDN)	163
7200/V34	128	56000/DIGITAL (ISDN)	164
7200/ARQ/VFC	129	56000/ARQ/DIGITAL (ISDN)	165
7200/ARQ/V34	130	64000 (ISDN)	166
9600/VFC	131	64000/ARQ (ISDN)	167
9600/V34	132	64000/DIGITAL (ISDN)	168
9600/ARQ/VFC	133	64000/ARQ/DIGITAL (ISDN)	169
9600/ARQ/V34	134	CHANNEL IN USE	170
12000/VFC	135	CHANNEL IN USE	171
12000/V34	136	CHANNEL IN USE	172

Message	#	Message	#
12000/ARQ/VFC	137	CHANNEL IN USE	173
12000/ARQ/V34	138	CHANNEL IN USE	174
14400/VFC	139	CHANNEL IN USE	175
14400/V34	140	CHANNEL IN USE	176
14400/ARQ/VFC	141	CHANNEL IN USE	177
14400/ARQ/V34	142	CHANNEL IN USE	178
16800/VFC	143	CHANNEL IN USE	179
16800/V34	144	32000	180
16800/ARQ/VFC	145	32000/ARQ	181
16800/ARQ/V34	146	32000/x2	182
19200/VFC	147	32000/ARQ/x2	183
19200/V34	148	36000	184
19200/ARQ/VFC	149	36000/ARQ	185
19200/ARQ/V34	150	36000/x2	186
31200	151	36000/ARQ/x2	187
31200/ARQ	152	40000	188
31200/V34	153	40000/ARQ	189
31200/ARQ/V34	154	40000/ARQ/x2	191
33600	155	44000	192
33600/ARQ	156	44000/ARQ	193
33600/V34	157	44000/x2	194
33600/ARQ/V34	158	44000/ARQ/x2	195
48000	196	38666	220
48000/ARQ	197	38666/ARQ	221
48000/x2	198	38666/x2	222
48000/ARQ/x2	199	38666/ARQ/x2	223
32000	200	40000	224
32000/ARQ	201	40000/ARQ	225
32000/x2	202	40000/x2	226
32000/ARQ/x2	203	40000/ARQ/x2	227
33333	204	41333	228
33333/ARQ	205	41333/ARQ	229
33333/x2	206	41333/x2	230
33333/ARQ/x2	207	41333/ARQ/x2	231

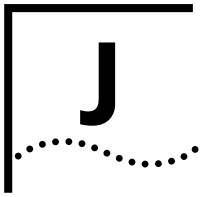
Message	#	Message	#
34666	208	42666	232
34666/ARQ	209	42666/ARQ	233
34666/x2	210	42666/x2	234
34666/ARQ/x2	211	42666/ARQ/x2	235
36000	212	61333	236
36000/ARQ	213	61333/ARQ	237
36000/x2	214	61333/x2	238
36000/ARQ/x2	215	61333/ARQ/x2	239
37333	216	64000	240
37333/ARQ	217	64000/ARQ	241
37333/x2	218	64000/x2	242
37333/ARQ/x2	219	64000/ARQ/x2	243

Result Codes Not Supported

The following result codes are not supported by HiPer DSP:

Message	#
9600/HST	23
9600/ARQ/HST	27
4800/ARQ/HST	29
7200/HST	30
12000/HST	31
12000/ARQ/HST	32
9600/V32	33
7200/ARQ/HST	34
14400/HST	35
14400/ARQ/HST	36
16800/HST	53
NUMBER BLACKLISTED	59
BLACKLIST FULL	60
+FVO	66
+FDM	67
+FHS	68
+FCS	69
+FIS	70

Message	#
+FTC	71
+FPO	72
+FTI	73
+FCI	74
+FPI	75
+FNF	76
+FNS	77
+FNC	78
+FET	79
+FPS	80
+FHT	81
+FHR	82
19200/HST	86
19200/ARQ/HST	89
21600/HST	92
21600/ARQ/HST	95
SECURITY ERROR	159
AT COMMAND DISABLED	160
ONLY QUERY ALLOWED	161



DISCONNECT CODES

This appendix contains:

- Supported disconnect codes
- Unsupported disconnect codes

Viewing Disconnect Codes

To view Disconnect Codes, view the ATI6 screen.

Disconnect Codes

Listed below are all Disconnect Codes and the numeric equivalent.

Verbal Reason	Numeric
DTR dropped	1
Escape Sequence	2
ATH Command	3
Carrier Loss	4
Inactivity Timer	5
MNP Incompatibility	6
Reserved	7
Link Password Mismatch	9
Retransmit Limit	10
LD Received	11
Loop Loss	12
Invalid Speed	13
Unable to Retrain	15
No Dial Tone	16
Key Abort	17
Busy	18
No Answer	19

Verbal Reason	Numeric
Voice	20
No Answer Tone	21
No Carrier	22
Reason Not Determined	23
V42 SABME Timeout	24
V42 Break Timeout	25
V42 Disconnect CMD	26
V42 Id Exchange Failed	27
V42 Stepup No Good	28
V42 Invalid Code Word	29
V42 String Length too Long	30
V42 Invalid Command Code	31
No Failure Disconnect	32
V32 Cleardown Disconnect	33
RCU Dies In Mid Security	34
Remote RCU access Denied	35
loop lost durrinc connect est	36
DS0 issued idle pattern	37
Prompting Not Enabled	38
No Prompting In Sync	39
Non ARQ Mode	40
Mode Incompatible	41
No Prompting In NON-ARQ	45
PKT BUS - Generic Error	46
PKT BUS LINK ERR - (TX Pre ACK)	47
PKT BUS LINK ERR - (TX Tardy ACK)	48
PKT BUS - Transmit Bus Timeout	49
PKT BUS - Receive Bus Timeout	50
PKT BUS LINK ERR - (TX TAL)	51
PKT BUS Link ERR - (RX TAL)	52
PKT BUS - Transmit Master Timeout	53
PKT BUS - Clock Missing	54
PKT BUS - Received LS while Link Up	55
PKT BUS - Out of Sequence Frame	56

Verbal Reason	Numeric
PKT BUS - Bad Frame	57
PKT BUS - ACK Wait Timeout	58
PKT BUS - Received ACK sequence Err	59
PKT BUS - Received OverFlow RNR Fail	60
PKT BUS - Received Msg Buf Overflow	61
Received Disconnect command from Gateway Card	62
Token passing timeout	64
MNP protocol violation	67
More than 128 Unacked LM-Is	68
Resources for call are unavailable	69
Reserved	70
PRI request timeout	71
Abort analog destination over ISDN	72
Normal user call clear	73
Normal unspecified event	74
Bearer incompatibility	75
Unspecified protocol error event	76
Abnormal Disconnection	77
No cause value available	78
No cause value available	79
No cause value available	80
Incoming Call -- Modem not available	81
Incoming Call -- Invalid Bearer Capability	82
Incoming Call -- Invalid Channel ID	83
Incoming Call -- Invalid progress Indication	84
Incoming Call -- Invalid Calling Party	85
Incoming Call -- Invalid Called Party	86
Incoming Call -- Call Blocked	87
Incoming Call -- Loop Start No Ring Off	88
Outgoing Call -- Telco Disconnect	89
Outgoing Call -- E&M Wink Timeout	90
Outgoing Call -- E&M Wink Too Short	91
Outgoing Call -- No Channel Available	92
DSP Rebooted	93

Verbal Reason	Numeric
DSP -- Did not respond to Keep Alive message	94
DSP -- Did not respond to disconnect request	95
DSP -- Tail Pointer Invalid	96
DSP -- Head Pointer Invalid	97
Data Processing Generaic Error	98
Timeslot Unavailable	99
GMT (Grench Mean Time) Unavailable from NMC	100
Chassis Awareness Unavailable from NMC	101

Disconnect Codes Not Supported

The following disconnect codes are not supported by HiPer DSP:

Verbal Reason	Numeric
Not used in HiPer DSP	0
Remote Control Password Mismatch	8
By RCU Command	14
Dial Back Security	42
Security Abort	43
Autopass Failed	44
DSP interrupt timeout	63
Not used in HiPer DSP	66

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T1 Feature Group Defaults

This appendix contains default parameters for the following Feature Groups:

- E&M default generic
- E&M Feature Group B (FGB)
- E&M Feature Group D (FGD)
- Loop Start
- Ground Start

This information applies to T1 lines only.

Feature Group Parameters

The following table contains a comparison of the default values of each Feature Group. For complete Feature Group parameter listing, see later in this appendix.

Feature Group / Parameter	E&M default generic	E&M FGB	E&M FGD	Loop Start	Ground Start
Line coding	8BZS	8BZS	8BZS	8BZS	8BZS
Frame type	ESF	ESF	ESF	ESF	ESF
Trunk start	Wink	Wink	Wink	Dial tone	Dial tone
Tone type	DTMF	MF	MF	DTMF	DTMF
ACK wink	Disabled	Disabled	Enabled	Disabled	Disabled
Address mode	DNIS	DNIS	DNIS ANI	No address	No address

E&M represents Ear and Mouth, which is telephony terminology for receive and transmit directions.

E&M Type II Generic Profile

The default generic profile and all related values are below.

Parameter	Value
Span1 Configured Signal Mode is (sigmode)	ROBBED BIT [robbedBit]
Span1 Signal Mode Active is	ROBBED BIT [robbedBit]
Span1 DNIS Enable is (dnisena)	DNIS ADDRESS [dnis]
Span1 Dial In Out Trunk Start (diotrst)	WINK [wink]
Span1 Dial In Address ACK Wink (daackwnk)	ACK WINK DISABLED [disabled]
Span1 Dial Out Address Delay (doadrdly)	70 milliseconds
Span1 Dial In Out Trunk Type (dtrnktyp)	E&M TYPE II [eAndMTypeII]
Span1 Idle Byte is (idlebyte)	0xFE
Span1 Block Call Type is (blcaltyp)	BLOCK NONE [blockNone]
Span1 Tone Type is (tonetype)	DTMF TONE [dtmf]
Span1 Number Of DTMF Tones is (numdtmft)	4
Span1 Dial Out Select Direction (dseldir)	DOWN [down]
Span1 Dial Out Next Timeslot (dntslot)	24
Span1 Channelized T1 Profile (cprofile)	E&M TYPE II GENERIC PROFILE [eAndMT ypeIIGeneric]

E&M Type II FGB Profile

The default Feature Group B profile and all related values are below.

Parameter	Value
Span1 Configured Signal Mode is (sigmode)	ROBBED BIT [robbedBit]
Span1 Signal Mode Active is	ROBBED BIT [robbedBit]
Span1 DNIS Enable is (dnisena)	DNIS ADDRESS [dnis]
Span1 Dial In Out Trunk Start (diotrst)	WINK [wink]
Span1 Dial In Address ACK Wink (daackwnk)	ACK WINK DISABLED [disabled]
Span1 Dial Out Address Delay (doadrdly)	70 milliseconds
Span1 Dial In Out Trunk Type (dtrnktyp)	E&M TYPE II [eAndMTypeII]
Span1 Configured Switch Type is (swtype)	5ESS [priSw5ESS]
Span1 Switch Type Active is	4ESS [priSw4ESS]
Span1 Idle Byte is (idlebyte)	0xFE
Span1 Ana Calls Blocked Err Code (ancbec)	58
Span1 Digi Calls Blocked Err Code (dcbec)	58
Span1 No IGWS Avail Err Code (noigwsav)	58

Parameter	Value
Span1 Chan Blocked Err Code (chanblck)	58
Span1 Block Call Type is (blcaltyp)	BLOCK NONE [blockNone]
Span1 Tone Type is (tonetype)	MF TONE [mf]
Span1 Number Of DTMF Tones is (numdtmft)	4
Span1 Dial Out Select Direction (dseldir)	DOWN [down]
Span1 Dial Out Next Timeslot (dntslot)	24
Span1 Channelized T1 Profile (cprofile)	E&M TYPE II FGB PROFILE IFGB]

E&M Type II FGD Profile

The default Feature Group D profile and all related values are below.

Parameter	Value
Span1 Configured Signal Mode is (sigmode)	ROBBED BIT [robbedBit]
Span1 Signal Mode Active is	ROBBED BIT [robbedBit]
Span1 DNIS Enable is (dnisena)	DNIS ANI ADDRESS [ani-dnis]
Span1 Dial In Out Trunk Start (diotrst)	WINK [wink]
Span1 Dial In Address ACK Wink (daackwnk)	ACK WINK ENABLED [enabled]
Span1 Dial Out Address Delay (doadrdly)	70 milliseconds
Span1 Dial In Out Trunk Type (dtrnktyp)	E&M TYPE II [eAndMTypeII]
Span1 Configured Switch Type is (swtype)	5ESS [priSw5ESS]
Span1 Switch Type Active is	4ESS [priSw4ESS]
Span1 Ana Calls Blocked Err Code (ancbec)	58
Span1 Digi Calls Blocked Err Code (dcbec)	58
Span1 No IGWS Avail Err Code (noigwsav)	58
Span1 Chan Blocked Err Code (chanblck)	58
Span1 Block Call Type is (blcaltyp)	BLOCK NONE [blockNone]
Span1 Tone Type is (tonetype)	MF TONE [mf]
Span1 Number Of DTMF Tones is (numdtmft)	4
Span1 Dial Out Select Direction (dseldir)	DOWN [down]
Span1 Dial Out Next Timeslot (dntslot)	24
Span1 Channelized T1 Profile (cprofile)	E&M TYPE II FGD PROFILE [eAndMTypeI IFGD]

Loop Start Profile

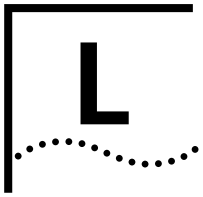
The default Loop Start profile and all related values are below.

Parameter	Value
Span1 Configured Signal Mode is (sigmode)	ROBBED BIT [robbedBit]
Span1 Signal Mode Active is	ROBBED BIT [robbedBit]
Span1 DNIS Enable is (dnisena)	NO ADDRESS [noAddress]
Span1 Dial In Out Trunk Start (diotrst)	DIAL TONE [dialTone]
Span1 Dial In Address ACK Wink (daackwnk)	ACK WINK DISABLED [disabled]
Span1 Dial Out Address Delay (doadrdly)	70 milliseconds
Span1 Dial In Out Trunk Type (dtrnktyp)	LOOP START [loopStart]
Span1 Configured Switch Type is (swtype)	5ESS [priSw5ESS]
Span1 Switch Type Active is	4ESS [priSw4ESS]
Span1 Idle Byte is (idlebyte)	0xFE
Span1 Ana Calls Blocked Err Code (ancbec)	58
Span1 Digi Calls Blocked Err Code (dcbec)	58
Span1 No IGWS Avail Err Code (noigwsav)	58
Span1 Chan Blocked Err Code (chanblck)	58
Span1 Block Call Type is (blcaltyp)	BLOCK NONE [blockNone]
Span1 Tone Type is (tonetype)	DTMF TONE [dtmf]
Span1 Number Of DTMF Tones is (numdtmft)	4
Span1 Dial Out Select Direction (dseldir)	DOWN [down]
Span1 Dial Out Next Timeslot (dntslot)	24
Span1 Channelized T1 Profile (cprofile)	LOOP START PROFILE [loopStart]

Ground Start Profile

The default Ground Start profile and all related values are listed below.

Parameter	Value
Span1 Configured Signal Mode is (sigmode)	ROBBED BIT [robbedBit]
Span1 Signal Mode Active is	ROBBED BIT [robbedBit]
Span1 DNIS Enable is (dnisena)	NO ADDRESS [noAddress]
Span1 Dial In Out Trunk Start (diotrst)	DIAL TONE [dialTone]
Span1 Dial In Address ACK Wink (daackwnk)	ACK WINK DISABLED [disabled]
Span1 Dial Out Address Delay (doadrdly)	70 milliseconds
Span1 Dial In Out Trunk Type (dtrnktyp)	GROUND START [groundStart]
Span1 Configured Switch Type is (swtype)	5ESS [priSw5ESS]
Span1 Switch Type Active is	4ESS [priSw4ESS]
Span1 Idle Byte is (idlebyte)	0xFE
Span1 Ana Calls Blocked Err Code (ancbec)	58
Span1 Digi Calls Blocked Err Code (dcbec)	58
Span1 No IGWS Avail Err Code (noigwsav)	58
Span1 Chan Blocked Err Code (chanblck)	58
Span1 Block Call Type is (blcaltyp)	BLOCK NONE [blockNone]
Span1 Tone Type is (tonetype)	DTMF TONE [dtmf]
Span1 Number Of DTMF Tones is (numdtmft)	4
Span1 Dial Out Select Direction (dseldir)	DOWN [down]
Span1 Dial Out Next Timeslot (dntslot)	24
Span1 Channelized T1 Profile (cprofile)	GROUND START PROFILE [groundStart]



SPAN COMMANDS AT A GLANCE

This appendix contains:

- Timeslot commands
- Span card commands
- Span line commands

For more detailed span line information, see Chapter 19, Console Interface Span Commands.

Timeslot Commands

DISPLAY Commands

Display commands show parameter settings and statistics of items found at the timeslot level. Each command parameter is explained below.

To display the item parameters for	Command
Timeslot AB signaling	display absig
Timeslot assigned channel	display achannel
Analog calls blocked error code	display ancbec
Timeslot configuration for each timeslot	display atconfig
Timeslot status and modem protocol for each timeslot	display atproto
Timeslot statistics for each timeslot	display atstat
Timeslot block call type	display bcalltyp
Span line block call type	display blcaltyp
Phone number call type	display calltype
Call control related configuration	display ccrcfig
Channel blocked error code	display chanblck
Continuous CRC errors	display contcrc

To display the item parameters for	Command
CHT1 user profile	display cprofile
Configured DSX1 receiver gain	display crgain
D-channel operations status	display d chanop
Dial-in address ACK wink	display daackwnk
Digital calls blocked error code	display dcbec
Dial in/out trunk start	display diotrst
DNIS enable setting	display dnisena
Dial-out next timeslot	display dntslot
Dial-out address delay (in milliseconds)	display doadrdly
Dial out select direction	display dseldir
Dial in/out trunk type	display dtrnktyp
Far end span statistics (Not supported in this release)	display far
Facilities Data Link setting	display fdl
Timeslot ID description	display iddescr
Idle byte sent to TELCO	display idlebyte
Jitter attenuation	display jittaten
DSX1 Line Coding	display lcoding
Loopback initialization originate	display liorig
Loopback configuration status	display loconfig
Line status	display lstatus
Line type	display ltype
Modem routing method	display mdmrmeth
Near end span statistics (received from the T1 carrier into the DS1 interface)	display near
NIC configuration type	display nicfgtyp
No IGWS available error code	display noigwsav
Near time elapsed	display ntimlaps
Number of DTMF tones	display numdtmft
Near valid intervals	display nvalint
Physical state	display physst
Remote initiate loopback setting	display rilpback
DSX1 receiver gain	display rxgain
Send code	display sendcode

To display the item parameters for	Command
Short-haul distance	display shauldis
Signal mode	display sigmode
Signal mode active	display smactive
Span statistics	display spnstats
Span monitor related configurables	display srconfig
Timeslot service state	display sstate
PRI switch type active status	display stactive
PRI switch type	display swtype
Timeslot configurations	display tconfig
Tone type	display tonetype
Trap enable states	display traps
Timeslot statistics	display tsstat
Transmit clock source	display txclksrc
TX Line Build Out setting in decibels	display txlibo

Span Card Commands

Span Card includes any configurations that would affect all the spans on a HiPer DSP card (if HiPer DSP supported more than one span), and would have to be set the same for all spans. An example would be modem routing method.

To execute the specified command to	Command
Restore configurations from factory defaults	cmd rdefault
Restore configurations from Flash	cmd rsspcfg
Save configurations to Flash	cmd svspcfg

Span Line Commands

Span Line includes any configurations that you can set independently for each E1 or T1 span (again, if HiPer DSP supported more than one span), such as the line coding.

CMD Commands

CMD commands execute specified commands to a timeslot or span line.

Some of these commands have an additional parameter that allows the card to execute the command immediately (hard), or upon the completion of any call(s) on the timeslot (soft)

To execute the specified command to	Command
Disconnect all calls on the span line.	cmd discall
Force a receiver reframe.	cmd freframe
Configure the loopback procedure.	cmd loconfig
Restore span card configuration from factory defaults.	cmd rdefault
Restore span card configuration from NVRAM.	cmd rsspcfg
Perform a specific sendcode type through the span monitor to the T1 line.	cmd sendcode
Place a span line back In Service. For T1 and T1-PRI only.	cmd sinserv
Take a span line Out Of Service. For T1 and T1-PRI only.	cmd sooserv
Save span card configuration to NVRAM.	cmd svspcfg

SET Commands

Set commands configure specific span line parameters.

To set specific span line parameters for	Command
Analog calls blocked error codes	set ancbec
Span line block call type	set blcaltyp
Phone number call type	set calltype
Channel blocked error code	set chanblck
CHT1 user profile	set cprofile
Configured receiver gain	set crgain
Dial in address ACK wink	set daackwnk
Digital calls blocked error code	set dcbec
Dial in out trunk start	set diotrst
DNIS enable	set dnisena
Dial out next timeslot	set dntslot
Dial out address delay	set doadrdly
Dial out select direction	set dseldir
Dial in out trunk type	set dtrnktyp
Facilities data link	set fdl

To set specific span line parameters for	Command
Idle byte	set idlebyte
Jitter attenuation	set jittaten
Line coding	set lcoding
Line type	set ltype
Modem routing method	set mdmrmeth
NIC configuration type	set nicfgtyp
No IGWS available error code	set noigwsav
Number of DTMF tones	set numdtmft
Remotely initialize loopback	set rilpback
Short haul distance	set shauldis
Signal mode	set sigmode
Switch type	set swtype
Tone type	set tonetype
Transmit clock source	set txclksrc
Transmit line build out	set txlibo

DISPLAY Commands

Use these commands to display parameter settings and statistics of items found at the span level.

To display parameters for	Command
Analog calls blocked error code	display ancbec
Timeslot configuration for each timeslot	display atconfig
Timeslot status and modem protocol for each timeslot	display atproto
Timeslot statistics for each timeslot	display atstat
Span line block call type	display blcaltyp
Phone number call type	display calltype
Call control related configuration	display ccrcfig
Channel blocked error code	display chanblck
Continuous CRC errors	display contcrc
Displays CHT1 user profile	display cprofile
Configured DSX1 receiver gain	display crgain
D-channel operations status	display d chanop
Dial-in address ACK wink	display daackwnk
Digital calls blocked error code	display dcbec

To display parameters for	Command
Dial-in/out trunk start	display diotrst
DNIS enable setting	display dnisena
Dial out next timeslot	display dntslot
Dial out address delay (in milliseconds)	display doadrdly
Dial out select direction	display dseldir
Dial in/out trunk type	display dtrnktyp
Idle byte sent to the telephone company	display idlebyte
Jitter attenuation	display jittaten
DSX1 Line Coding	display lcoding
Loopback initialization originate	display liorig
Loopback configuration status	display loconfig
Line status	display lstatus
Line type	display ltype
Modem routing method	display mdmrmeth
Near end span statistics (received from the T1 carrier into the DS–1 interface)	display near
NIC configuration type	display nicfgtyp
No IGWS available error code	display noigwsav
Near time elapsed	display ntimlaps
Number of DTMF tones	display numdtmft
Near valid intervals	display nvalint
Physical state	display physst
Remote initiate loopback setting	display rilpback
DSX1 receiver gain	display rxgain
Send code	display sendcode
Short haul distance	display shauldis
Signal mode	display sigmode
Signal mode active	display smactive
Span statistics	display spnstats
Span monitor related configurables	display srconfig
PRI switch type active status	display stactive
PRI switch type	display swtype

To display parameters for	Command
Tone type	tonetype
Trap enable states	display traps
Transmit clock source	display txclksrc
Tx Line Build Out setting in decibels	display txlibo

USING E1/R2 SIGNALLING

HiPer DSP supports both E1/PRI and E1/R2 signalling. In this appendix you will find information about E1/R2 signalling, also known as R2-MFC. Specifically, this appendix contains:

- E1 and R2 overview
- Configuring the HiPer DSP span interface for R2

Configuring the modems is not mentioned in this section because all previous information about configuring the modems is applicable. For more information about configuring the modems, refer to the Table of Contents.

Overview

E1 E1 is the European counterpart of the T1. It is capable of throughput up to 2.048 Mbps.

E1/R2 E1/R2 signalling is a forerunner to E1/PRI. Engineers developed E1/R2 in the early 1970s to allow faster call setups in the PSTN. It is a signalling type, which most E1 users adopted, with some local variations. The governing ITU-T standards are in the Q.400 series, but many places have their own standards, and may not call it E1/R2 even though they use the same basic concepts and procedures.

R2 Digital Line Signalling

Line signalling is the means of basic call setup and teardown, with no transmission of numbers or other call details. ITU-T Recommendations Q.421 and Q.422 describe the signalling scheme for use on PCM circuits

using Channel Associated Signalling in channel 16 of the 2048 kbps E1 bitstream. In this framing format, R2 uses the bits in timeslot 16 of each frame to signal events for each traffic channel in turn. The four bits dedicated to a given traffic channel are known as the abcd bits. Digital R2 Line Signalling uses the a and b bits to signal call setup and cleardown events, the c and d bits being unused. The a and b bits are known as af and bf in the forward direction, ab and bb in the backward direction.

R2 MFC Register Signalling

Devices, such as HiPer DSP, use register signalling to transmit the called and calling numbers and other information to other devices. The devices do this by using in-band multi-frequency signalling.

R2 MFC (Multiple Frequency Compelled signalling) uses two of the six frequencies in each direction, and it can change the meaning of the signals by transmitting certain backward signals, giving two groups of 15 signals in each direction: Groups I and II in the forward direction and Groups A and B in the backward direction. Groups I and A are referred to as Groups III and C when signalling the calling party number.

In the MFC register signalling scheme, devices transmit signals until other devices acknowledge the signal. The originating device sends a forward signal continuously, and when the answering device receives the signal, it sends a backward signal to acknowledge. On receipt of the backward signal, the originating exchange stops transmitting, and when the answering exchange detects the end of the forward signal, it stops transmitting. The compelled cycle begins again with the next forward signal. The backward signal used to acknowledge the forward signal also determines what information the next forward signal should convey.

For more information about E1 and E1/R2, refer to the following URL:

International Telecommunication Union: http://www.itu.org/

Configuring the HiPer DSP Span Interface for E1/R2

The following tables include the commands available at the span level.

To view the current settings of the R2-related parameters, enter "display r2" from the span command level.

Physical Parameters

Use this table to configure the physical setup .

Parameter	Command	Options	Use this command to
Line Type	set ltype	mfe1, crcmfe1	Set the line type to G.704 CAS with or without CRC-4. Reboot to activate.
Line Coding	set lcoding	hdb3	Set the line coding scheme to High Density Bipolar 3 Zeroes.
Signalling Mode	set sigmode	bitorien	Set signalling mode to bit oriented.
Tone Type	set tonetype	r2mfctone	Set the tone generation and detection, which uses R2 MFC frequencies.
Line Direction	set linedirect	incoming, outgoing, both	Set the call direction. HiPer DSP automatically restarts the protocol stack.
Companding Scheme	set compand	alaw, mulaw, auto	Select the companding scheme the HiPer DSP uses for register signals and modem calls.
Delay from LOS to Call Clearing	set delaylos	0 to 10 000 ms	Set the required duration of a loss of signal (LOS) condition before the HiPer DSP drops active calls reinitializes signalling.

Line Signalling Parameters

Use this table to configure line signalling.

Parameter	Command	Options	Use this command to
Line Signalling Type	set linesigtype	r2d, p7, r2em	Select the line signalling protocol for incoming and outgoing calls.
Unused ABCD Bits	set unusedabcd	0 to 15 (representing 0000 to 1111)	Determine the value of the ABCD bits, which the HiPer DSP does not use for line signalling.

Parameter	Command	Options	Use this command to
Persistence Override	set persisov	00 to 255 (0 disables override, 1 to 255 set 10 to 2550 ms)	Set the received line signal persistence longer than normal for noisy lines. Use with care, as too large a value causes signalling protocol errors.
Use Seize Acknowledge Line Signal	set seizeack	enable, disable	Determine whether or not the HiPer DSP is using the SeizeAck signal.
Use Forced Release Line Signal	set forcedrel	enable, disable	Determine whether or not HiPer DSP uses the Forced Release signal to clear R2 calls.
Seize / Clearforward on Startup	set clrfwd	enable, disable	Determine whether or not a repeated Seize / Clearforward sequence is sent on startup. This command provokes a response from the attached equipment.
Pulsed Idle on Clearback	set piclrbck	enable, disable	Determine whether or not a HiPer DSP sends a repeated Release / Seize Ack sequence while attempting to clear an incoming call.
Clear Call on Unexpected Line Signal	set clrcall	enable, disable	Determine whether HiPer DSP clears an active call when it receives an unexpected line signal or ignores the signal.
Delay Before Answer	set delayans	100 to 2000 ms	Set the delay between the end of register addressing and transmission of the Answer line signal.
Release Guard Duration	set relguard	0 to 2000 ms	Set the duration for which the HiPer DSP transmits the release guard signal in response to a clear forward signal, which the HiPer DSP received before returning to the idle state.
Default Incoming Calling Party Category	set incomcpc	analog, digital, test, maintenance	Determine the default CPC if HiPer DSP does not receive one from an incoming call.
Accept Incoming Call In Glare Condition	set inglare	enable, disable	Determine whether HiPer DSP accepts the incoming call and drops the outgoing call in a glare condition, or if HiPer DSP drops both calls

Register Signalling Parameters Use this table to configure register signalliing parameters.

Parameter	Command	Options	Use this command to
Register Signalling Type	set regsigtype	r2mfc, r2mfsc	Select register signalling protocol for incoming and outgoing R2 calls, ignored for P7. You may disable register signalling. See below.
Register Signalling Status	set regsigstat	enable, disable	Determine whether or not you are using register signalling for E1/R2. HiPer DSP automatically disables register signalling for P7.
Project ID for Country Specific Profile	set projid	ITU-T, Argentina, Australia, Brazil, Chile, China, Colombia, India, Korea, Malaysia, Mexico, NewZealand, Philippines, Sweden, Venezuela	Set the R2 country specific profile.
Address Complete	set addrcompl	a-3, a-5, a-6	Set the backward register signal to indicate that the B-number reception is complete: - if A-3, the signal is "address complete, use group II" and the next forward signal is the call category - if A-5 or A-6, the signal is "address complete, charge" and the Answer line signal should follow
Subscriber Busy	set cldsubbusy	b-2, b-3	Set the backward register signal to indicate that the called subscriber is busy.
Subscriber Free	set insubfree	b-1, b-5, b-6	Activate the backward register signal, which the HiPer DSP uses to indicate it accepts the incoming call.
Wrong Number	set wrongnum	b-5, b-7	Set the backward register signal to indicate a wrong or unallocated number.

Incoming B-Number Length	set bnumlen	1 to 36	Set the number of digits the HiPer DSP will accept before sending "address complete".
Last Incoming B-Number Digit Timeout	set lstbditout	100 to 10 000 ms	Set the timeout for HiPer DSP to receive the next B-number digit.
Action on B-Number Digit Timeout	set actbtout	endofb, error	Determine whether HiPer DSP treats the expiration of the timeout above as the valid end of the B-number or whether it treats it as a signalling error.
Request A-Number	set anumiden	enable, disable	Determine whether or not HiPer DSP requests the A-number on incoming calls.
Request A-Number After Incoming B-number Digit	set anumbnum	1 to 36	Set the number of B-number digits after the HiPer DSP requests the A-number.
Send Calling Party Category	set clgprtycat	a-5, a-6	Set backward register signal to request transmission of the calling party category.
Send A-Number Digit N+1	set anumreq	c-1, c-5, c-6, c-9	Set the backward register signal to request transmission of next A-number digit.
A-number Not Available	set anumnav	enable, disable	Determine whether or not I-12, when HiPer DSP receives 1-12 as the first digit, means that the A-number is not available.
End of A-number	set endanum	iii-12, iii-15	Activate the signal, which indicates that the HiPer DSP received all the A-number digits.
Dummy A-Number	set dumanum	1 to 36 digits	Use a dummy A-number for outgoing calls.
Send B-number Digit N	set sndbnumn	a-9, a-10	Set the backward signal, which the HiPer DSP interprets as a request for B-number digit N.
Send B-number Digit N-1	set sndbnumn1	a-2, a-8, a-9, a-10	Set the backward signal, which the HiPer DSP interprets as a request for B-number digit N-1.
Send B-number Digit N-2	set sndbnumn2	a-7, a-9	Set the backward signal, which the HiPer DSP interprets as a request for B-number digit N-2.
Send B-number Digit N-3	set sndbnumn3	a-8, a-10	Set the backward signal, which the HiPer DSP interprets as a request for B-number digit N-3.

Send First B-number Digit	set sndfbnum	a-2, a-9, a-10	Set the backward signal, which the HiPer DSP interprets as a request for the first B-number digit.
Send I-15 at End of B-Number	set endbparty	enable, disable	Determine whether or not HiPer DSP receives I-15 after the last B-number digit.
Incoming Calling Party Category Map	analog, digital, test, maintenanc e	set incatmap	Determine the meaning of each forward CPC signal II-1 to II-15.
Outgoing Calling Party Category Map	set outcatmap	ii-1 to ii-15	Determine the outgoing calling party category signal, which the HiPer DSP uses for each call type.

Default Span Configuration

The tables below contain the default ITU-T compatible configurations, and are followed by variations used in certain countries. For a country not listed below and for signal assignment information, which is not available, the ITU-T settings are a useful starting point for determining the appropriate configuration.

Physical Parameters

Use this table to configure the phsycial parameters.

Parameter	Command	ITU-T
Line Type	ltype	mfe1
Line Coding	lcoding	hdb3
Signalling Mode	sigmode	bitorien
Tone Type	tonetype	r2mfctone
Line Direction	linedirect	both
Companding Scheme	compand	auto
Delay from LOS to Call Clearing	delaylos	6000

Line Signalling Parameters

Use this table to configure line signalling.

Parameter	Command	ITU-T
Line Signalling Type	linesigtyp	r2d
Unused ABCD bits	unusedabcd	5
Persistence Override	persisov	0

Parameter	Command	ITU-T
Use Seize Acknowledge	seizeack	enable
Use Forced Release	forcedrel	disable
Seize / Clearforward on Startup	clrfwd	disable
Pulsed Idle on Clearback	piclrbck	enable
Clear Call on Unexpected Signal	clrcall	enable
Delay Before Answer	delayans	100
Release Guard Duration	relguard	400
Default Incoming CPC	incomcpc	analog
Accept Incoming Call In Glare Condition	inglare	disable

Some exchanges send meter pulses to the calling party in the answered phase, and can affect the operation of the HiPer DSP during outgoing calls. When the HiPer DSP receives a meter pulse during the answered phase, it will interpret it as a clearback signal, because the bit pattern for both is 1101; therefore, the call will be dropped. To correct this, set the line signal Persistence Override to a value greater than the meter pulse duration. For example, if the meter pulse duration is 150 ms, set persisov 20 sets persistence to 200 ms. A side effect is that all line signals must persist for this duration before they are recognized, and call setup takes slightly longer. If persistence is set too high, calls may fail due to protocol timeouts.

Register Signalling Parameters

The settings below are contingent upon network exchange equipment supporting A-number identification (ANI). If the equipment does not support ANI, disable the parameter Request A-number.

Parameter	Command	ITU-T
Register Signalling Type	regsigtype	r2mfc
Register Signalling Status	regsigstat	enable
Project ID for Country Specific Profile	projid	itu-t
Address Complete	addrcompl	a-3
Subscriber Busy	cldsubbusy	b-3
Subscriber Free	insubfree	b-6

Parameter	Command	ITU-T
Wrong Number	wrongnum	b-5
Incoming B-number Length	bnumlen	4
Last Incoming B-digit Timeout	lstbditout	2000
Action on B-digit Timeout	actbtout	endofb
Request A-number	anumiden	disable
Request A-number after B-digit	anumbnum	1
Send Calling Party Category	clgprtycat	a-5
Send A-number Digit N+1	anumreq	c-5
A-number Not Available	anumnav	disable
End of A-number	endanum	iii-15
Send B-number Digit N	sndbnumn	a-9
Send B-number Digit N-1	sndbnumn1	a-2
Send B-number Digit N-2	sndbnumn2	a-7
Send B-number Digit N-3	sndbnumn3	a-8
Send First B-number Digit	sndfbnum	a-10
Send I-15 at end of B-number	endbparty	enable
Incoming CPC Map	incatmap	analog
Outgoing CPC Map	outcatmap	analog : ii-1 digital : ii-6 test : ii-13 maint : ii-3

If HiPer DSP receives one of the group B register signals during an outgoing call, it will by default treat the signal as 'Subscriber Free' or 'Subscriber Busy' according to the table below.

Register Signal	Treat as
B-1	Subscriber Free
B-2	Subscriber Free
B-3	Subscriber Free
B-4	Subscriber Busy
B-5	Subscriber Free

Register Signal	Treat as
B-6	Subscriber Free
B-7	Subscriber Free
B-8 to B15	Subscriber Busy

Country Specific Variations

Example

From the console interface, the user can select a country profiles which configures the R2 parameters for that country. For more information, see the tables in this section.

Example: `set projid china`

By entering that command, you first set all R2 parameters to default values and then set the specific parameters for China as shown later in this section.

B-Digits

Some countries do not use I-15 for end of B-number. The receiving equipment must either send Address Complete when it has received enough B-digits, or detect the end of the B-number using a timeout. You should set the Incoming B-number Length parameter to the number of B-digits that the network will offer. If the number set here is greater than the number of available B-digits, the last B-digit timeout will expire when no more B-digits are offered, and the HiPerDSP will send a pulsed Address Complete signal to continue call setup.

Users in some countries may not use all of the B-number digit handling parameters. Also, some users may need to change subsets of some of the country specific profiles. In certain cases, these changes could cause duplicate assigned values. Where this occurs, HiPer DSP automatically assigns unused B-number digit handling parameters to avoid conflict. B-number digit handling parameters, which may cause duplication of values are indicated by asterisks in the tables below.

Argentina

All parameters as per ITU-T. See the beginning of this section, Default Span Configuration.

Australia (P2)

Parameter	Command	Australia
Delay before Answer	delayans	1000
Request A-number	anumiden	disable
Subscriber Busy	cldsubbusy	b-2
Subscriber Free	insubfree	b-1
Incoming B-number Length	bnumlen	see B-Digits section on page L-10
*Send B-number Digit N-1	sndbnumn1	a-10
Send I-15 at end of B-number	endbparty	disable
Outgoing CPC Map	outcatmap	analog : ii-2

Conflicting Parameter Reassignment	Command	Australia
Send First B-number Digit	sndfbnum	a-2

HiPer DSP does not support A-number collection in P2; therefore, users must disable A-number request.

Brazil

Parameter	Command	Brazil
Subscriber Busy	cldsubbusy	b-2
Subscriber Free	insubfree	b-1
Wrong Number	wrongnum	b-7
Incoming B-number Length	bnumlen	see B-Digits section on page L-10
End of A-number	endanum	iii-15
*Send B-number Digit N-1	sndbnumn1	a-9
Send I-15 at end of B-number	endbparty	disable

Conflicting Parameter Reassignment	Command	Brazil
Send B-number Digit N	sndbnumn	a-10
Send First B-number Digit	sndfbnum	a-2

Chile

All parameters as per ITU-T. See the beginning of this section, Default Span Configuration.

China

Parameter	Command	China
Unused ABCD bits	unusedabcd	3
Subscriber Busy	cldsubbusy	b-2
Subscriber Free	insubfree	b-1
Incoming B-number Length	bnumlen	see B-Digits section on page L-10
Send Calling Party Category	clgprtycat	a-6
Send A-number Digit N+1	anumreq	c-1
*Send First B-number Digit	sndfbnum	a-2
Send I-15 at end of B-number	endbparty	disable
Incoming CPC Map	incatmap	ii-3 : analog
Outgoing CPC Map	outcatmap	analog : ii-3

Conflicting Parameter Reassignment	Command	China
Send B-number Digit N-1	sndbnumn1	a-10

Colombia

Parameter	Command	Colombia
Subscriber Busy	cldsubbusy	b-2
Subscriber Free	insubfree	b-1
Send Calling Party Category	clgprtycat	a-6
Send A-number Digit N+1	anumreq	c-1
*Send First B-number Digit	sndfbnum	a-2
Outgoing CPC Map	outcatmap	analog : ii-2

Conflicting Parameter Reassignment	Command	Colombia
Send B-number Digit N-1	sndbnumn1	a-10

India

Parameter	Command	India
Request A-number	anumiden	Disable
Incoming B-number Length	bnumlen	see B-Digits section on page L-10
*Send B-number Digit N-1	sndbnumn1	a-9
*Send First B-number Digit	sndfbnum	a-2
Send I-15 at end of B-number	endbparty	Disable

Conflicting Parameter Reassignment	Command	India
Send B-number Digit N	sndbnumn	a-10

The signalling sequence for A-number collection in India is significantly different from other countries, and is not supported in this release. Therefore, users must disable A-number request.

Korea

All parameters as per ITU-T. See the beginning of this section, Default Span Configuration.

Malaysia

Parameter	Command	Malaysia
Release Guard Duration	relguard	800
Subscriber Busy	cldsubbusy	b-2
Subscriber Free	insubfree	b-1
Incoming B-number Length	bnumlen	see B-Digits section on page L-10
Send Calling Party Category	clgprtycat	a-6

Parameter	Command	Malaysia
Send A-number Digit N+1	anumreq	c-6
*Send B-number Digit N-1	sndbnumn1	a-8
*Send B-number Digit N-2	sndbnumn2	a-9
Send I-15 at end of B-number	endbparty	disable
Outgoing CPC Map	outcatmap	analog : ii-2

Conflicting Parameter Reassignment	Command	Malaysia
Send B-number Digit N	sndbnumn	a-10
Send B-number Digit N-3	sndbnumn3	a-10
Send First B-number Digit	sndfbnum	a-2

Mexico

Parameter	Command	Mexico
Subscriber Busy	cldsubbusy	b-2
Subscriber Free	insubfree	b-1
Incoming B-number Length	bnumlen	see B-Digits section on page L-10
Send Calling Party Category	clgprtycat	a-6
Send A-number Digit N+1	anumreq	c-1
*Send First B-number Digit	sndfbnum	a-2
Send I-15 at end of B-number	endbparty	disable
Outgoing CPC Map	outcatmap	analog : ii-2

Conflicting Parameter Reassignment	Command	Mexico
Send B-number Digit N-1	sndbnumn1	a-10

Some switches in Brazil send III-15 in response to C-5 to indicate the end of the A-number, and send III-12 if the A-number is not available, or if no further A-number digits are available (implying that the switch has some, but not all of the A-number digits).

For incoming calls, the HiPerDSP interprets both III-12 and III-15 as End of A-number regardless of the endanum parameter.

For outgoing calls, if the HiPerDSP sends III-12 in response to C-5, it could result in the connection being dropped, therefore we recommend setting End of A-number to III-15 as shown above.

New Zealand

All parameters as per ITU-T. See the beginning of this section, Default Span Configuration.

Philippines

Parameter	Command	Philippines
A-number Not Available	anumnav	Enable

Sweden (P7)

Parameter	Command	Sweden
Line Signalling Type	linesigtyp	p7
Use Forced Release	forcedrel	disable
Seize / Clearforward on Startup	clrfwd	disable
Pulsed Idle on Clearback	piclrbck	disable

P7 uses DTMF register signalling, which is not supported in this software. Therefore register signalling is automatically disabled when P7 is selected.

Venezuela

Parameter	Command	Venezuela
Send A-number Digit N+1	anumreq	c-9

Operational Details

Signal Detection

When HiPer DSP detects a valid E1 signal after power-up, reboot, signal loss or a change in the configured line direction, HiPer DSP transmits a sequence of line signals on each channel in order to initialize the line and provoke a response from attached equipment:

```
Incomingtransmit Block (11xx) followed by Release/Idle (10xx)
Outgoingtransmit Seize (00xx) followed by Clearforward/Idle
(10xx)
Bothwayincoming procedure followed by outgoing procedure
```

HiPer DSP repeats the outgoing Seize / Clearforward every 60 seconds until a Release is received, unless a user disables the sequence. Information about disabling the sequence is available in the previous span configuration section.

Transmit Levels and Receive Threshold

Frequencies

Each register signal consists of two frequencies, with separate frequency groups for forward and backward signals, giving 15 signals in each direction. The combinations are consistent with Q.441. See below.

Tone	Forward	Backward	f0	f1	f2	f3	f4	f5
f0	1380 Hz	1140 Hz	-	1	2	4	7	11
f1	1500 Hz	1020 Hz	-	-	3	5	8	12
f2	1620 Hz	900 Hz	-	-	-	6	9	13
f3	1740 Hz	780 Hz	-	-	-	-	10	14
f4	1860 Hz	660 Hz	-	-	-	-	-	15
f5	1980 Hz	540 Hz	-	-	-	-	-	-

Transmit Level

The absolute power level of each frequency in a register signal is -11.5 dBm, which corresponds to a nominal value of -8.0 dBm. HiPer DSP transmits both frequencies in each signal at the same level: the twist is 0 dB.

Receive Threshold

The receive threshold for HiPer DSP detecting register signals is -31.5 dBm. This is not affected by changes to the Modem Country Code setting.

Channel Blocking

In the R2 protocol, users may block channels individually in the backward direction by transmitting the Block line signal (11xx), so that no calls are offered on that channel. This software detects blocking applied by the network, and allows the user to apply blocking. The user can block or unblock an individual channel at the timeslot prompt, or a complete span at either the timeslot or span prompt using the following commands:

`cmd tblock` (block timeslot)
`cmd tunblock` (block timeslot)
`cmd sblock` (span)
`cmd sunblock` (span)

When the user blocks a timeslot, the 'Blocking' in the 'display atstat' and 'display tsstat' commands shows BLOCKED. Timeslots can be blocked while a call is active. In this case, 'status service state' will indicate blocked, but the HiPer DSP will not send block signal until the call is terminated.

When the HiPerDSP is receiving a block signal, the 'Status' in the 'display atstat' and 'display tsstat' commands show Blocked. In this state the HiPerDSP will not make an outgoing call.

Call Types

HiPer DSP supports analog (including V.34+ modem calls and V.90), digital, test and maintenance calls.

The R2 protocol allows devices to specify a call type of 'digital', but it does not allow devices to specify further details (i.e. whether an incoming call is V.110, V.120 or X.75). The HiPer DSP applies this to incoming calls using the Auto-detect feature. For more information about the Auto-detect feature, refer to the Configuring the HiPer DSP Modems section in the beginning of this appendix.

Test and maintenance calls are handled as analog calls.

Matching DNIS Numbers on Incoming Calls

Certain countries require HiPer DSP to determine if an incoming call is destined for the chassis: match the incoming DNIS number against the locally configured number(s). The Hiper DSP currently not capable of this, as it does not store local numbers. The solution is to provide a table of

DNIS numbers in the Hiper DSP. When an incoming call arrives, the HiPer DSP matches the DNIS number against the entries in the table. If a match is found, the call is accepted. If no match is found, the HiPer DSP must determine how to handle the call. Users can configure the HiPer DSP to a) accept the call, b) reject the call, c) accept the call as an analog call or d) accept the call as a digital call.

3Com has extended the Call Type Override table to provide this functionality. Using the command `bnumnfnd`, a new command from that table, the user can select how the HiPer DSP will respond when no match is found for the DNIS number on an incoming call. When the HiPer DSP rejects calls, it does so based on the value of `wrongnum`.

Example: To reject all calls with DNIS numbers, which do not match any entry in the table, enter the following:

`set calltype 1 7000 n` (Creates single entry in call type table)
`set bnumnfnd rejall` (Reject all calls when no match found for DNIS)

Based on that setting, the HiPer DSP will reject all calls that do not match '7000' (the DNIS).

Trace Facilities

Tracing call activity may be enabled at several levels. Any combination may be enabled, but incomplete traces result if several traces are enabled during periods of high call activity.

Trace Options

The lowest-level protocol handling task is task number 30. Below are the commands for enabling task number 30. The first command below is very useful for tracing R2 line and register signal activity, providing similar information to a protocol analyzer.

`trc dbg 30 1` (summary of R2 line and register signalling activity)

`trc dbg 30 2` (full details of task activity)

Task number 29 interfaces between the protocol engine and the rest of the software. Below are the commands for enabling task number 29. The first command below provides details of dialled numbers for incoming and outgoing calls, as well as any physical level activity.

`trc dbg 29 1` (summary of incoming and outgoing calls at CAS task level)

`trc dbg 29 2` (full details of task activity)

Two higher layer tasks also have useful trace outputs. These are the layers performing call control actions, and both are state / event machines. The commands, which enable those tasks are below:

`btrc dbg 31 1` (protocol dependent call state / event activity)

`trc grp cc` (protocol independent call state / event activity)

Recommended Use

3Com recommends users to initially enable the **`trc dbg 30 1`** and **`trc dbg 29 1`** traces for all call attempts, as the call output will help users adjust the HiPer DSP configuration to match network requirements.

In the event of call failure, which users cannot resolve by reconfiguring HiPer DSP, the user should repeat the failed call with the **`trc dbg 30 2`**, **`trc dbg 31 1`**, and **`trc grp cc`** traces enabled. The user should then return both sets of traces to 3Com for further analysis.

For information about contacting 3Com, refer to the About This Reference section in the front of this reference.

Sample Trace

Below is a sample trace of a typical incoming call. For clarity, timestamps and channel numbers have been removed, and comments added. Messages from A_LINE_RS and A_REG_RS are received signals, messages to A_LINE_SR and A_REG_SR are transmitted signals. Many variations in both signal assignment and signalling sequence are possible, so this trace should be used only as a guide.

```
A_LINE_RS -> PRO_A_INC : 0300 Seize_In
PRO_A_INC -> A_LINE_SR : 0364 Szack_Out
A_REG_RS  -> A_REG_CM  : 0382 I_2/* First B-number digit : 2
A_REG_CM  -> A_REG_SR  : 03B5 A_5/* Send Calling Party
Category
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 0391 II_1/* Calling party category :
1
A_REG_CM  -> A_REG_SR  : 03D5 C_5/* Send next A-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 03AA III_10/* First A-number digit :
0
```

```
A_REG_CM  -> A_REG_SR  : 03D5 C_5/* Send next A-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 03A1 III_1/* Second A-number digit :
1
A_REG_CM  -> A_REG_SR  : 03D5 C_5/* Send next A-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 03A2 III_2/* Third A-number digit :
2
A_REG_CM  -> A_REG_SR  : 03D5 C_5/* Send next A-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 03A3 III_3/* Fourth A-number digit :
3
A_REG_CM  -> A_REG_SR  : 03D5 C_5/* Send next A-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 03AF III_15/* End of A-number
A_REG_CM  -> A_REG_SR  : 03B1 A_1/* Send next B-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 038A I_10/* Second B-number digit :
0
A_REG_CM  -> A_REG_SR  : 03B1 A_1/* Send next B-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 0385 I_5/* Third B-number digit : 5
A_REG_CM  -> A_REG_SR  : 03B1 A_1/* Send next B-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 0387 I_7/* Fourth B-number digit : 7
A_REG_CM  -> A_REG_SR  : 03B1 A_1/* Send next B-number digit
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 038F I_15/* End of B-number
A_REG_CM  -> A_REG_SR  : 03B3 A_3/* Address complete
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
A_REG_RS  -> A_REG_CM  : 0391 II_1/* Calling party category :
1
CEI_CONNECT_REQ A(4) : 0123 B(4) : 2057 C(1) : 0
A_REG_CM  -> A_REG_SR  : 03C6 B_6/* Subscriber free
A_REG_RS  -> A_REG_CM  : 0375 Silence
A_REG_CM  -> A_REG_SR  : 0375 Silence
PRO_A_INC -> A_LINE_SR : 0365 Answer_Out
```

N

For users of Total Control Quad Modem Cards

Use this appendix if your site uses Quad modems. In this appendix you will find information about the following:

- Quad modem features currently not supported by HiPer DSP
- AT Commands not supported that return OK
- AT Commands not supported that return ERROR
- S-Registers not supported

Overview

HiPer DSP NIC and NAC support one span line and up to 24 modems (30 modems for E1 users).

This high modem port density allows you to perform the same functions as:

- Six Quad modem NACs and six Quad modem NICs, or
- Six Quad modem NACs, one span line NIC (such as E1, T1, or PRI) and one span line NAC (such as E1, T1, or PRI).

With Quad modem, a standard Total Control chassis supports up to 60 modems per chassis. With HiPer DSP cards in the Total Control chassis, up to 420 modems are supported per chassis.

Quad Features Not Supported By HiPer DSP

The following Quad modem features are not supported in HiPer DSP 2.0:

- Cellular protocols
- Fax protocols
- V.FC, V.25 *bis*, V.54, and HST protocols
- Flow control (software or hardware)
- Loopback testing
- Online Command Mode

- Remote access
- Remote password
- Synchronous support

HiPer DSP does not contain NVRAM. Instead, it uses Flash memory to store, retrieve, and change settings.

AT Commands Not Supported That Return OK

The following commands are not supported by HiPer DSP but return an OK message.

Command	Description
Bn	US/ITU-T answer sequence
Cn	Transmitter
Fn	Duplex
I0	Product Code
I1	Displays results of ROM checksum test
Kn	Clock
P	Pulse dial
USR	Display Modem development credits
&Bn	DTE data rate (d)
&Cn	Carrier detect
&Dn	Data Terminal Ready (d)
&Hn	Transmit flow control (d)
&In	Receive software flow control (d)
&Pn	Pulse dial make/break ratio
&Rn	Received data hardware (RTS) flow control (d)
&Sn	DSR override (d)

AT Commands Not Supported That Return ERROR

The following commands are not supported by HiPer DSP and return an ERROR message.

Command	Description
Gn	Send command to Data Pump
GJ	Change country table values
H1	Go off hook
I2	Memory (RAM) test

Command	Description
I10	Security account status
J	Frequency spectrum
Mn	Speaker
NX	Test mode V.32 - reset modem
NL	Test mode V.32 - download new DSP code
Nn	Request speed shift
On	Online (d)
RS99	Display copyright notice
Yn	Set default profile/report
&Ln	Leased line operation
&Xn	Synchronous clock source
&ZC	Command macro processing
%A	Set up host security account
%B	Serial port rate for remote access session
%Cn	Configuration control during remote access session, where n = 0-2
%E	Erase Dial Security setting
%F	Remote access configure data format
%L	Select password for local access
%N	V25 *bis* Synchronous Bit Rate
%P	Remote access password programming
%S	Grant Local Access
%V	Select password For Autopass Security
%X	Idle pattern for SYNC over packet bus
%Y	BCC type for SYNC over packet bus
%Z	Line encoding for SYNC over packet bus
S17	Display connect reason
*C	Constant carrier
~P	Store and query the plug-and-play data stored in NVRAM
<Ctl> S	Control character
<Ctl> C	Control character

S-Registers Not Supported

HiPer DSP does not support the following S-Registers:

S17, S20-S26, S30, S32-33, S35-36, S39-46, S53, S57-S59, S69-70.

Unlike version 1.0, HiPer DSP 2.0 supports S-Registers s89 and s90.

TECHNICAL SPECIFICATIONS

HiPer DSP adheres to the following standards, ensuring compatibility with a wide range of modems.

Standard	Description
x2 / V.90	Up to 56 kbps downstream and V.34 speeds upstream. Currently, FCC regulations limit x2 to 53 kbps.
V.34	33.6 kbps, 31.2 kbps, 28.8 kbps/26.4 kbps/24 kbps/21.6 kbps/19.2 kbps/14.4 kbps/ 12 kbps/9600/7200/4800 bps
V.32 *bis* Plus	21.6 kbps/19.2 kbps/16.8 kbps/14.4 kbps/12 kbps/9600 bps/ 7200/ 4800 bps
V.32 *bis*	14.4 kbps/12 kbps/9600/7200/4800 bps
V.32	9600/4800 bps
V.22	1200 bps. Compatible with Bell 212A.
V.22 *bis*	2400 bps
Bell 212A	1200 bps
V.42	LAPM error control, 1200 bps and higher
V.42 *bis*	Data compression, 1200 bps and higher
MNP	Levels 2, 3 and 4 error control, level 5 data compression, 1200 bps and higher
V.8	Answer sequence for calls originating in the U.S. and Canada
V.110	Rate adaptation protocol supports the following speeds: 600 bps/ 1200 bps/ 2400 bps/ 4800 bps/7200 bps/ 9600 bps/12 bps/ 14.4 kbps/ 19.2 kbps
V.23	12,000/75 bps and 75/1200 bps
Bell 103	300 bps
X.75	Rate adaptation protocol supports 75 bps through 2048 kbps.

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