CommWorks
a 3Com company

Total Control® 1000 Enhanced Data System

Getting Started Guide

Release 4.5

Part Number 10048403

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About This Guide

About This Guide contains an overview of this guide, lists guide conventions, related documentation, and product compatibility, and describes how to contact customer service.

This guide describes how install the hardware, and initializing and configuring the individual hardware cards.

This guide is intended for those individuals responsible for installing the hardware and performing the initial configuration of the hardware.

Release notes are issued with some products—visit our website at http://totalservice.commworks.com. If the information in the release notes differs from the information in this guide, follow the instructions in the release notes.

Conventions

Table 1 lists notice icons used in this guide:

Table 1 Notice Icon Descriptions

Icon	Notice Type	Description
	Information Note	Information that contains 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.

Table 2 lists text conventions in this guide.

Table 2 Text Convention Descriptions

Convention	Description
Text represented as a `screen display`	`This typeface` represents displays that appear on your terminal screen, for example: `Netlogin:`
Text represented as **menu** or **sub-menu names**.	**This typeface** represents all menu and sub-menu names within procedures, for example: On the **File** menu, click **New**.
Text represented by <filename>	This typeface represents a variable. For example: <filename>.

Screen Captures

The screens in this guide may not represent what you see on your monitor; use them only as guidelines.

Related Documentation

The following documents contain additional information about CommWorks Total Control® 1000 components, operations, systems, and procedures that may be referenced in this manual:

Total Control 1000 Enhanced Data System

The following documents relate to the Total Control 1000 Enhanced Data System:

- Total Control 1000 Enhanced Data System *System Overview Guide* - Part Number 10048404
- Total Control 1000 Enhanced Data System *Getting Started Guide* - Part Number 10048403
- Total Control 1000 Enhanced Data System *Operations Guide* - Part Number 10048402
- Total Control 1000 Enhanced Data System *Maintenance Guide* - Part Number 10048391
- Total Control 1000 Enhanced Data System *Trouble Locating and Clearing Guide* - Part Number 10048400
- Total Control 1000 Enhanced Data System *Modem and Span Command Line Reference* - Part Number 10048399
- Total Control 1000 Enhanced Data System *Access Router Card 5.5 Command Line Reference* - Part Number 10048398
- Total Control Manager for Windows and UNIX *Getting Started Guide* - Part Number 10045614
- CommWorks 5115 Common Element Manager *User's Guide* - Part Number 10047652
- CommWorks 5115 Common Element Manager for Total Control 1000 *User Guide* - Part Number 10048397

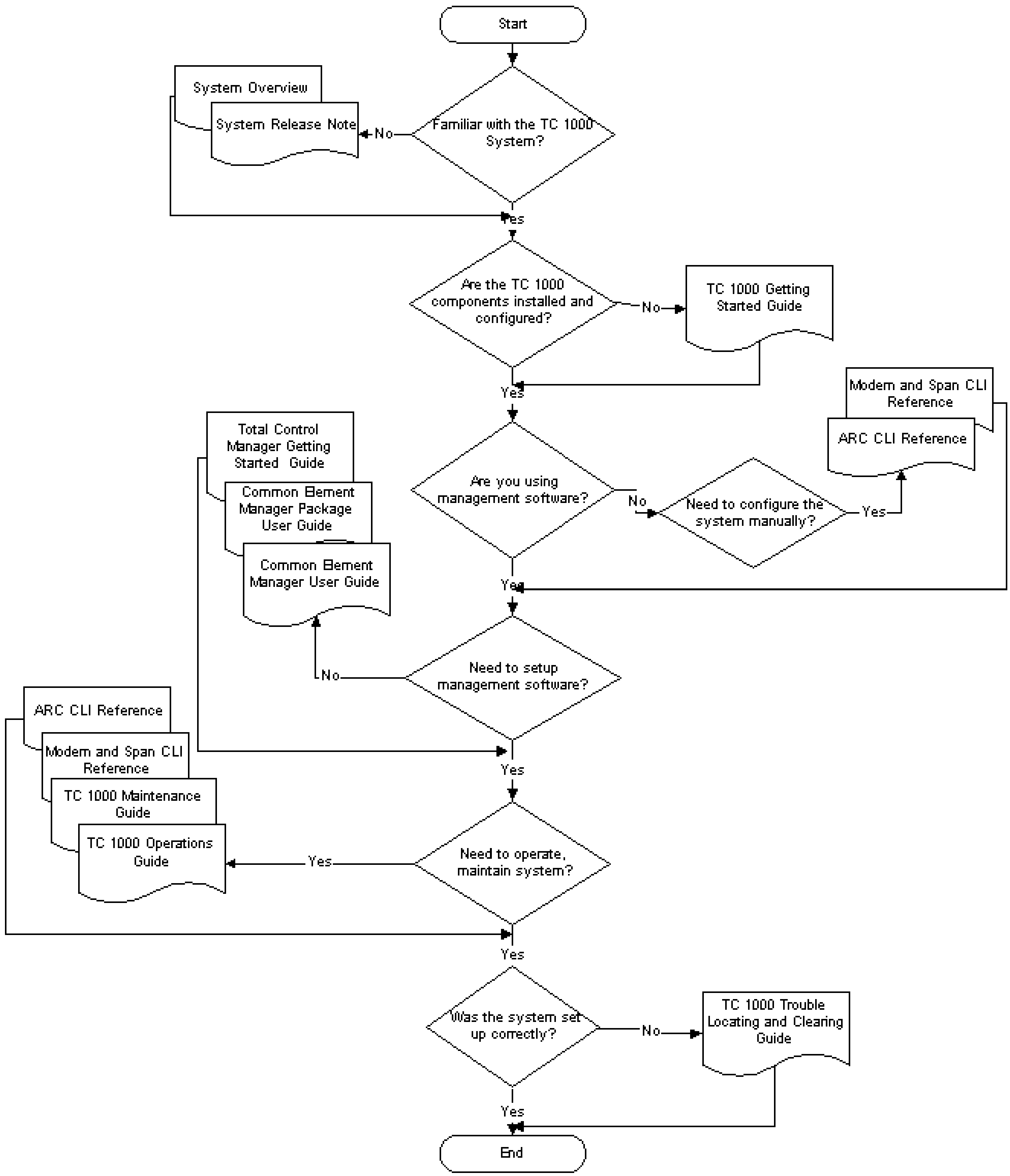
Total Control HiPer System

Some documents from the Total Control MultiService Access Platform (the HiPer system) also relate to the Total Control 1000 Enhanced Data System.

- HiPer ARC Network Application Card *Getting Started Guide* - Part Number 10031739
- PCI Dual 10/100Base-T Ethernet Network Interface Card *Getting Started Guide* - Part Number 1.024.1330-02
- PCI Dual V.35 10/100 Ethernet PCI Network Interface Card *Getting Started Guide* - Part Number 1.024.1959-01
- Quad T1/E1 10/100 Ethernet PCI Network Interface Card *Getting Started Guide* - Part Number 1.024.1973-00
- Dual DS3 Asynchronous Transfer Mode Network Interface Card *Getting Started Guide* - Part Number 10030485
- Dual E3 Asynchronous Transfer Mode Network Interface Card *Getting Started Guide* - Part Number 10031642
- HiPer DSP Network Application Card *Getting Started Guide* - Part Number 10030920
- HiPer DSP T1/E1 Network Interface Card *Getting Started Guide* - Part Number 1.024.1310-02
- HiPer NMC Network Application Card *Getting Started Guide* - Part Number 10030486
- 10/100 Ethernet Aux I/O Network Application Card *Getting Started Guide* - Part Number 1.024.1309-01

Use the following documentation map to help you install and configure your Total Control 1000 system.

Figure 1 Documentation Map



Contacting Customer Service

For information about customer service, including support, training, code releases and updates, contracts, and documentation, visit our website at http://totalservice.commworks.com.

Refer to the Documentation CD-ROM for information about product warranty.

Before contacting technical support, have this information available:

- Contract number
- Problem description
  - Symptoms
  - Known causes
- Product information
  - Software and hardware versions
  - Serial numbers
- Trouble locating and clearing attempts

1 TOTAL CONTROL 1000 OVERVIEW

This chapter describes the hardware in the Total Control® 1000. It contains the following topics:

- Total Control 1000 Chassis
- Installation Process
- Installation Tools

Total Control 1000 Chassis

The Total Control 1000 Enhanced Data System chassis is a powerful data communications platform that supports a broad variety of data, voice, and video applications.

Figure 2 Total Control Chassis

The chassis, is the main building block of the Total Control 1000 system. It is a rack-mountable enclosure with a high-speed, multi-layer midplane. Up to 17 front-loaded Network Application Cards (NACs) and rear-loaded Network Interface Cards (NICs) can be loaded into the chassis. These NACs and NICs interface with the midplane through 180-pin high-density connectors as shown Figure 3. In addition to the midplane, the chassis possesses an integrated fan tray which provides cooling for the installed cards.

Cards installed in the chassis receive power through the midplane from two front-loaded power supply units (PSUs) and their corresponding rear-loaded power supply interfaces (PSIs). Two power supplies provide full redundancy and load-sharing.

Chassis Components

The general layout of the Total Control 1000 chassis is as follows:

Figure 3 Chassis Schematic

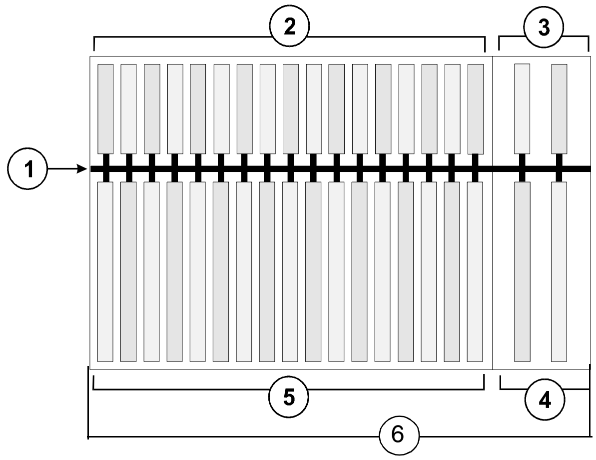


Table 3 identifies the callouts in Figure 3.

Table 3 Chassis Schematic Description

Callout	Description
1	Chassis Midplane
2	Network Interface Card (NIC)
3	Power Supply Interface (PSI)
4	Power Supply Unit (PSU)
5	Network Application Cards (NAC)
6	Chassis Fan Tray

Chassis Midplane

The chassis midplane contains multiple data busses that allow communications between each of the cards in the chassis.

The midplane busses are as follows:

- Management Bus—The NAC management bus provides dedicated, full duplex, 512 Kbps serial channels that run from the network management card slot to each of the NAC slots. This bus lets the network management card communicate with installed cards for configuration, status queries, issuing commands, performing tests, and downloading software to the NACs.

  The management bus consists of the NAC management bus and the NIC management bus. It spans all 17 slots of the chassis.

The NIC management bus provides a common serial channel from the network management card to each NIC, and an individual dedicated serial channel from each NIC to the network management card. This bus operates at 9600 bps and lets the network management card manage the network interface directly.

- Packet Bus—The Packet bus, which allows inter-card communications between all NACs in the chassis, It spans all chassis slots except the seventeenth. The network management card, located in this slot, does not have access to the Packet bus. The Packet bus is a 10 MHz, 32-bit wide parallel bus that is used between packet-oriented devices, such as access router card and the chassis modems.
- Time Division Multiplexed Bus—The Time Division Multiplexed (TDM) bus carries traffic between circuit-switched devices, such as a E1 card and a digital modem. Like the packet bus, the TDM bus spans slots 1 through 16 of the chassis. The TDM bus consists of multiple TDM channels passing synchronous serial data, providing 2048 full duplex, 64 Kbps time slots.

  The TDM bus which passes data between the NIC and the NAC consists of 24, 64 Kbps time slots.
- Peripheral Component Interconnect Bus—Communication between a some NACs and their corresponding NICs is accomplished through the Peripheral Component Interconnect (PCI) bus. The PCI bus is a 25 or 33 MHz, 32 bit parallel bus that complies with version 2.0 and 2.1 of the PCI specification.

Network Interface Cards

The Network Interface Cards (NIC) are located in the back of each NAC. They are used to provide access to the network. They must be installed before its associated NAC.

Power Supply Units and Interfaces

The Total Control 1000 system receives power from two front-loaded Power (PSU) and their corresponding rear-loaded Power Supply Interfaces (PSI). The PSU/PSI sets are available with ratings of 130 Amp in AC or DC versions. With the two PSU/PSI sets installed, automatic redundant switch over and automatic shut-off in over-voltage and short-circuit conditions is supported.

All power connections are made at the rear of the chassis at the PSI. Each PSI has its own cabling interface as well as its own power switch. At the front of the chassis, the PSU has LEDs indicating both PSU and PSI power status.

Network Application Cards

The Network Application Cards (NACs) are located in the front of the chassis. They are used to process the traffic as defined by the type of card it is. They generally indicate the status of the traffic as it is processed through the card by way of LEDs.

There are five types of network application cards:

- Network Management Card Set —The network management card manages all the cards on the chassis.
- Access Router Card Set —The access router card receives incoming traffic from DSP multispan cards, encrypts the information and forwards this traffic on to the various egress ports.
- DSP Multispan Card Set—The DSP multispan card terminates the E1 span and routes it to the access router card.
- DS-3 Ingress Card Set—The DS-3 Ingress card provides Wide Area Network (WAN) ingress options for the DSP multispan modem system.
- SDH STM-0 Card Set—The SDH STM-0 card provides an optical WAN ingress option for the DSP multispan modem system.

Chassis Fan Tray

At the bottom of the chassis is an integrated fan tray containing 15 fans. These fans provide cooling and ventilation for the cards in the chassis. The fan tray receives power internally from the chassis power supplies so there is no additional external cabling associated with it.

The system can be configured to set alarms should any fan on the tray fail. This helps protect against the possibility of a system shutdown due to over heating.

There are three electro static discharge (ESD) plugs—two on the front mounting flanges and one on the rear.

Installation Process

To successfully install Total Control 1000 4.5 system you need to follow these steps that are contained in this guide unless otherwise specified.

1. Install the chassis
2. Install the fan tray
3. Install the power supply
4. Install the network management card set
5. Initialize the network management card set
6. If you are maintaining your Total Control 1000 hub with a management tool, install either common element manager, or total control manager.

   To install common element manager, refer to the CommWorks Common Element Manager User Guide, or to install Total Control Manager, refer to the Total Control Manager Getting Started Guide for installation procedures.

7. Install the access router card set
8. Initialize the access router card set
9. Install the DSP multispan card set

10 Initialize the DSP multispan card set

Installation Tools

Unless otherwise noted, you will need a #2 Phillips and a flat-head screwdriver to install the componets of the Total Control 1000 system.

For more information beyond initial configuration and how to configure Total Control 1000 to meet your specific needs, refer to CommWorks Total Control 1000 Enhanced Data System *Operations Guide*.

I

CHASSIS COMPONENTS

Chapter 2 Installing a Single Chassis in a Rack

Chapter 3 Installing and Removing Power Supplies

2 INSTALLING A SINGLE CHASSIS IN A RACK

This chapter describes the procedure to install the CommWorks Total Control® 1000 chassis in a rack.

This chapter contains the following topics:

- Introduction
- Required Materials and Tools
- Installing a Chassis in a 19-inch Rack
- Installing a Chassis in a 23-inch Rack
- Installing the Optional Chassis Door
- AC Fan Tray Installation
- DC Fan Tray Installation
- DC Cabling
- International Fan Tray Installation
- Removing the Fan Tray
- Constructing a Chassis Earth Ground

For the technical specifications for the chassis, refer to Appendix B Technical Specifications.

Introduction

The Total Control 1000 chassis is designed to be installed in a standard rack. To prevent damage, see the instructions packed with the selected stand for more information.

This chapter covers three common rack-mounting methods:

- Standard mount
- Mid-mount
- Rear mount

If installing more than one chassis, leave a gap of at least 1 U (1.75 in.) between each chassis for proper ventilation.

Required Materials and Tools

To install the chassis you need:

- A flat-head screwdriver
- A #2 Phillips screwdriver
- Fasteners (nuts, bolts, screws) compatible with the rack

Optional:

- Extender brackets (for 23-inch rack or mid-mount installation)

Installing a Chassis in a 19-inch Rack

There are a variety of Total Control 1000 chassis mounting options with standard 19-inch racks. These options are:

- Standard Mount
- Mid-mount
- Rear-mount

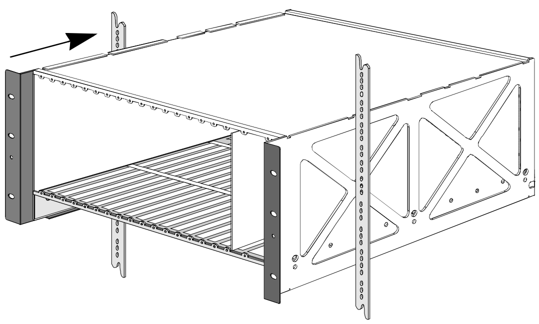
Standard Mount

To install the chassis in a 19-inch rack:

1 Remove the fan tray; refer to the Removing the Fan Tray section.

2 Slide the chassis into the rack, until the front of the chassis is flush with the front of the rack.

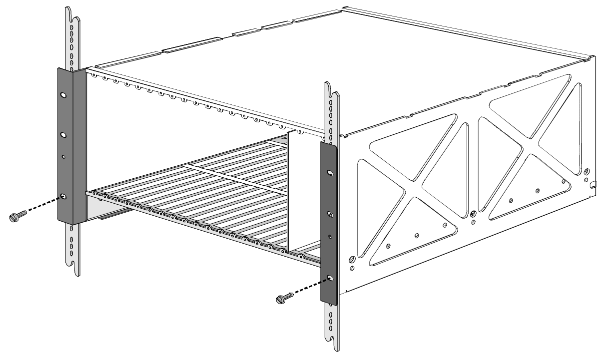
Figure 4 Standard Mount 19-inch Rack Step 1



3 Secure the chassis mounting flange to the front vertical rails of the rack.

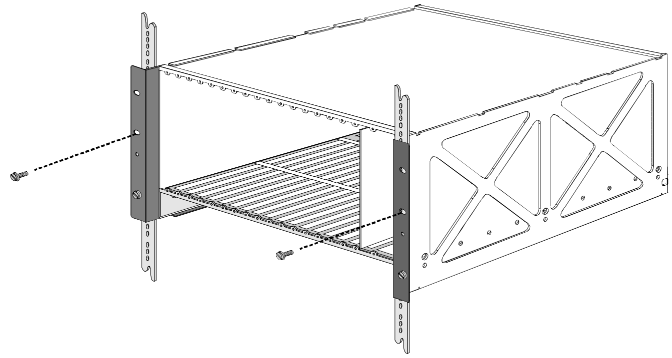
   a Insert the two bottom fasteners (screws).

Figure 5 Standard Mount 19-inch Rack Step 2



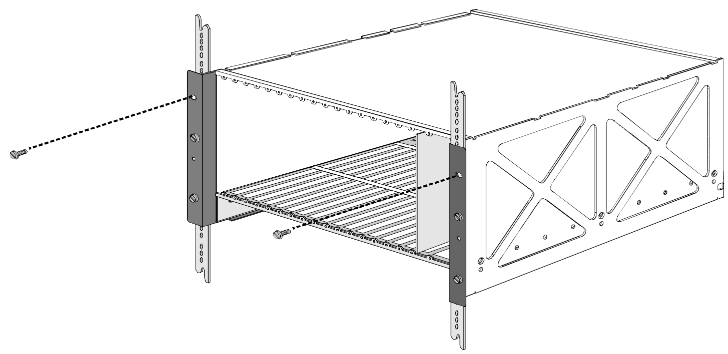
b Insert the two middle fasteners (screws).

Figure 6 Standard Mount 19-inch Rack Step 3



c Insert the two top fasteners (screws).

Figure 7 Standard Mount 19-inch Rack Step 4



4 Re-install the fan tray; refer to the appropriate installation of the tray fan chapter.

Mid-mount To mid-mount the chassis in a 19-inch rack:

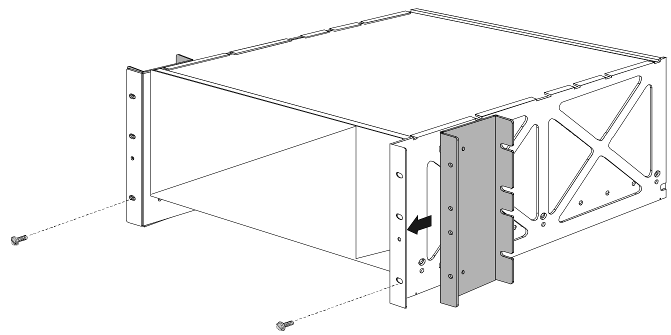
1 Remove the fan tray; refer to the Removing the Fan Tray section.

2 Secure the extender brackets to the chassis mounting flanges.

Mid-mount brackets must be used if you wish to adhere to the Bellcore Standard on Earthquakes NEBS TR-NWT-000063, Sections 5.5.7 and 5.5.9, Issue 5.

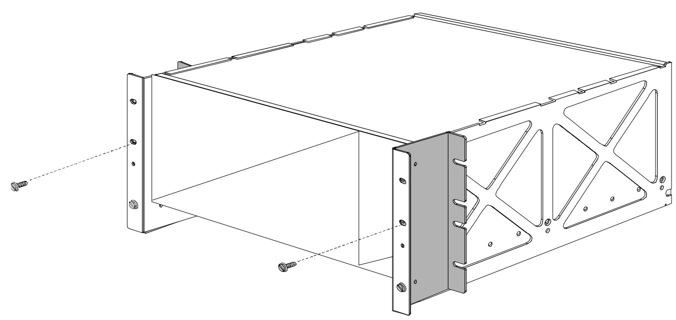
a Insert the two bottom fasteners (screws).

Figure 8 Mid-Mount 19-inch Rack Step 1



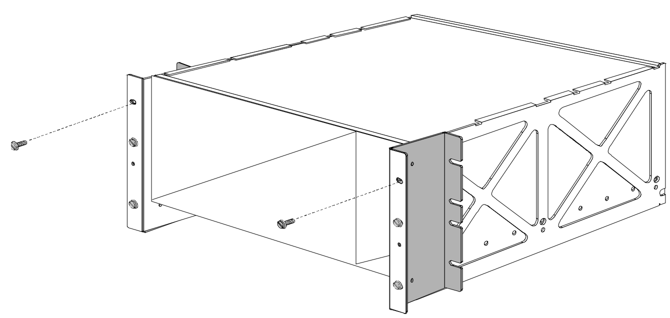
b Insert the two middle fasteners (screws).

Figure 9 Mid-Mount 19-inch Rack Step 2



c Insert the two top fasteners (screws).

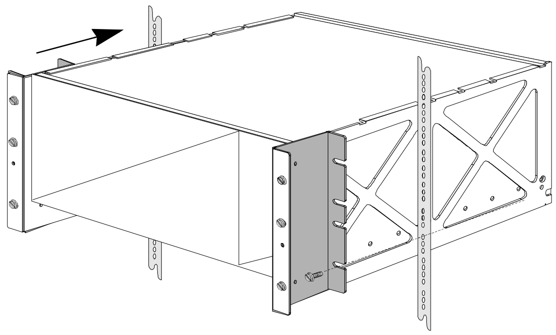
Figure 10 Mid-Mount 19-inch Rack Step 3



3 Secure the extender brackets and chassis to the mounting rails of the rack.

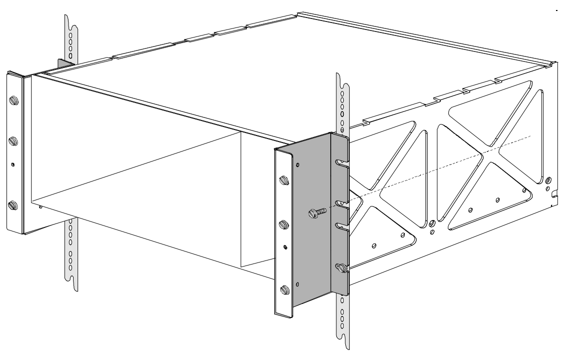
a Insert the two bottom fasteners (screws).

Figure 11 Mid-Mount 19-inch Rack Step 4



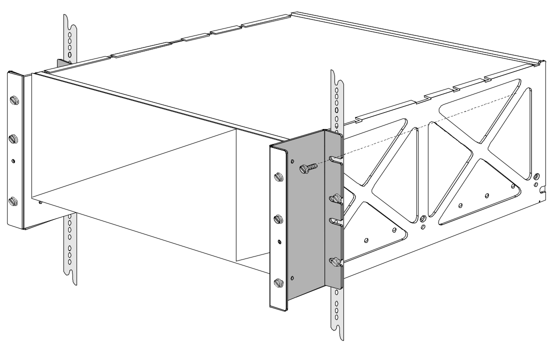
b Insert the two middle fasteners (screws).

Figure 12 Mid-Mount 19-inch Rack Step 5



c Insert the two top fasteners (screws).

Figure 13 Mid-Mount 19-inch Rack Step 6

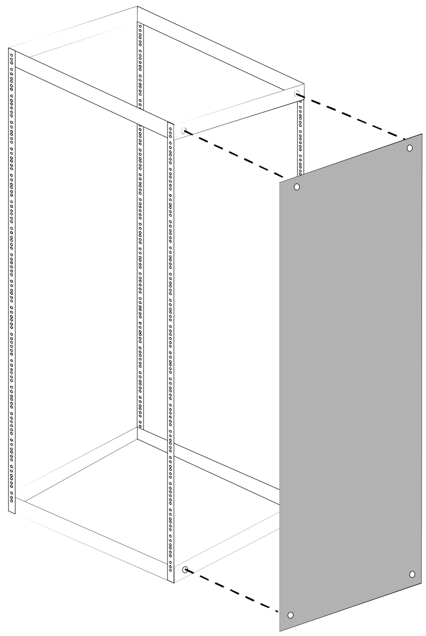


4 Re-install the fan tray; refer to the Removing the Fan Tray section.

Rear-mount To rear-mount the chassis in a 19-inch rack:

1 Remove the equipment rack sides.

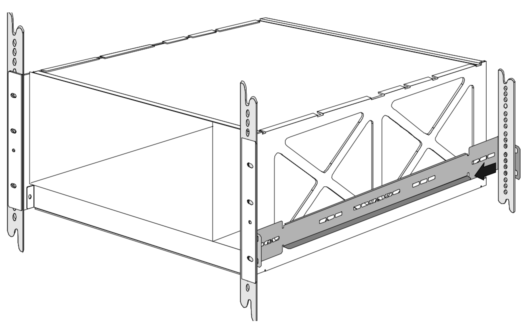
Figure 14 Rear-Mount 19-inch Rack Step 1



2 Install the chassis; refer to the Standard Mount section.

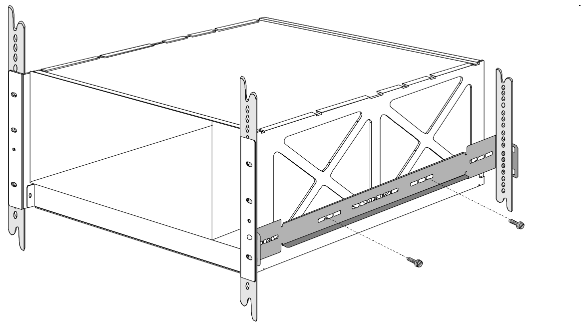
3 Slide the rear-mounting bracket into the back of the rack. Line the bracket mounting holes with the threaded mounting holes on the chassis side, ensuring the bracket rear mounting flange meets the rack rear mounting rail.

Figure 15 Rear-Mount 19-inch Rack Step 2



4 Secure the bracket to the chassis.

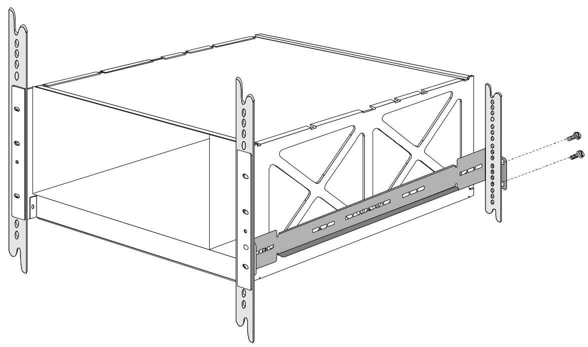
Figure 16 Rear-Mount 19-inch Rack Step 3



5 Repeat Step 3 and Step 4 for the other side of the chassis.

6 Secure the bracket rear-mounting flanges to the rack rear mounting rails.

Figure 17 Rear-Mount 19-inch Rack Step 4



Installing a Chassis in a 23-inch Rack

There are a variety of Total Control 1000 chassis mounting options with standard 23-inch racks. These options are:

- Standard Mount
- Mid-mount
- Rear-mount

Standard Mount

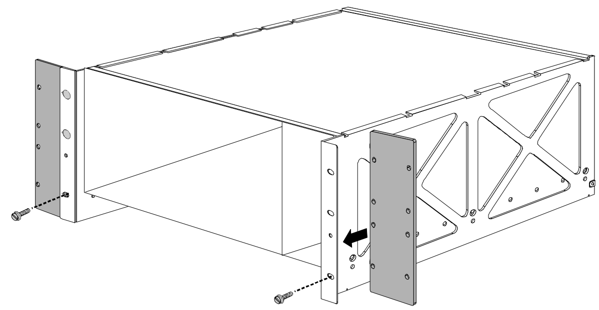
To install the chassis in a 23-inch rack:

1 Remove the fan tray; refer to the Removing the Fan Tray section.

2 Secure the extender brackets to the chassis mounting flanges.

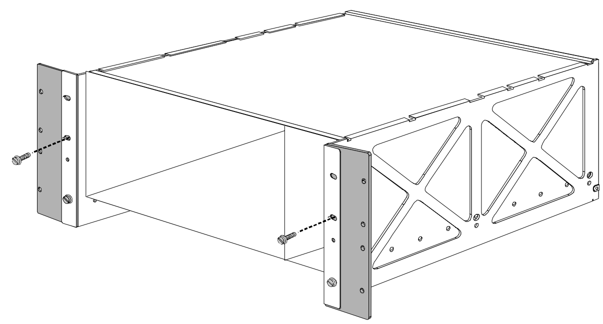
   a Insert the two bottom fasteners (screws).

Figure 18 Standard-Mount 23-inch Rack Step 1



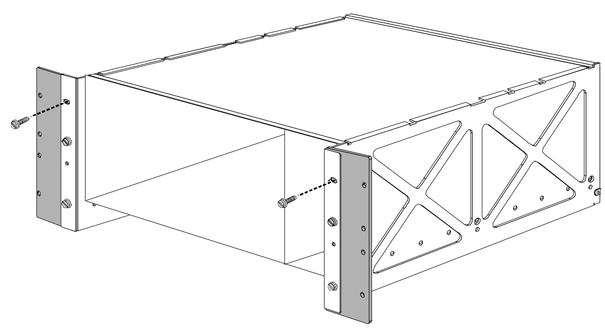
b Insert the two middle fasteners (screws).

Figure 19 Standard-Mount 23-inch Rack Step 2



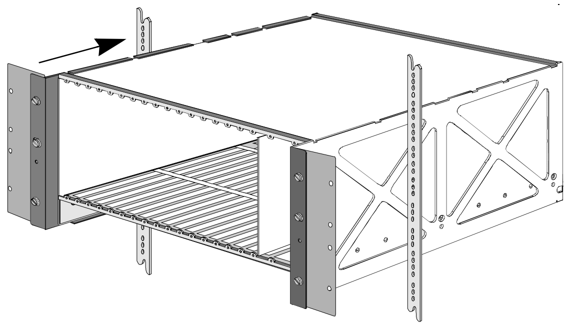
c Insert the two top fasteners (screws).

Figure 20 Standard-Mount 23-inch Rack Step 3



3 Slide the chassis into the rack, until the front of the chassis is flush with the front of the rack.

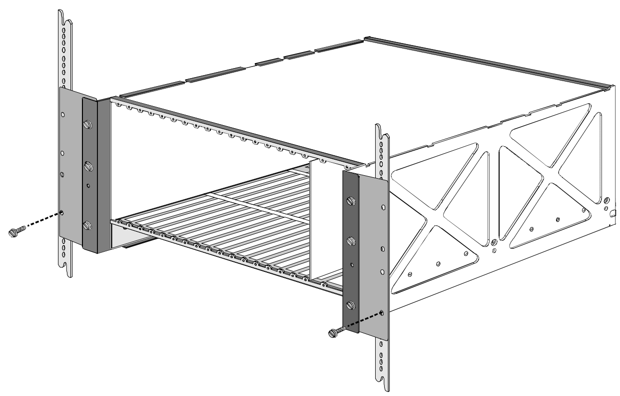
Figure 21 Standard-Mount 23-inch Rack Step 4



4 Secure the extender brackets and chassis to the mounting rails of the rack.

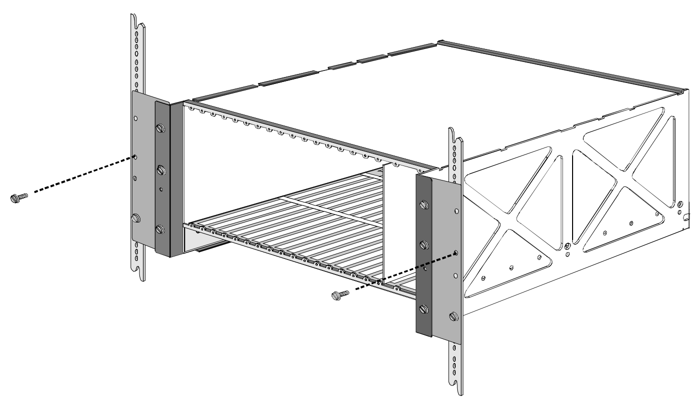
a Insert the two bottom fasteners (screws).

Figure 22 Standard-Mount 23-inch Rack Step 5



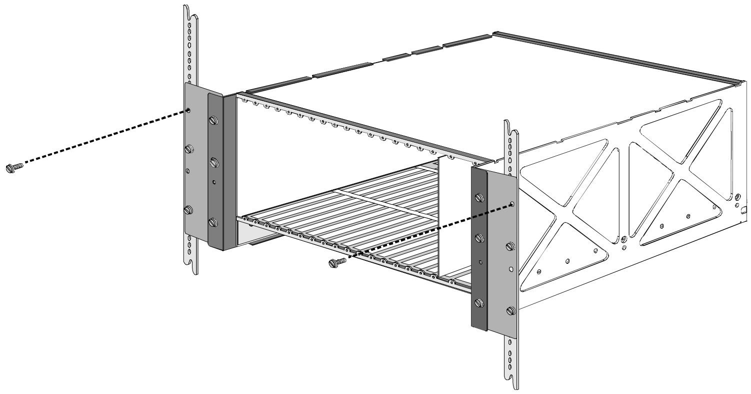
b Insert the two middle fasteners (screws).

Figure 23 Standard-Mount 23-inch Rack Step 6



c Insert the two top fasteners (screws).

Figure 24 Standard-Mount 23-inch Rack Step 7



5 Re-install the fan tray; refer to the Removing the Fan Tray section.

Mid-mount To mid-mount the chassis in a 23-inch rack:

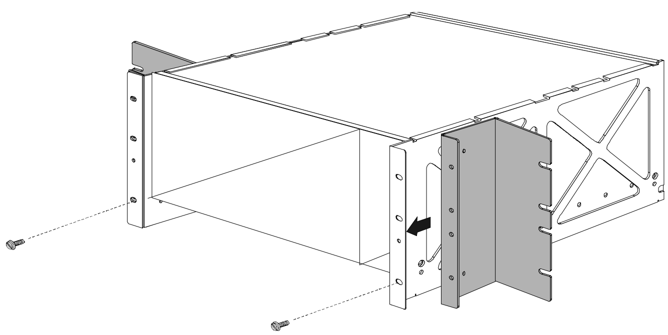
1 Remove the fan tray; refer to the Removing the Fan Tray section.

2 Secure the extender brackets to the chassis mounting flanges.

Mid-mount brackets must be used if you wish to adhere to the Bellcore Standard on Earthquakes NEBS TR-NWT-000063, Sections 5.5.7 and 5.5.9, Issue 5.

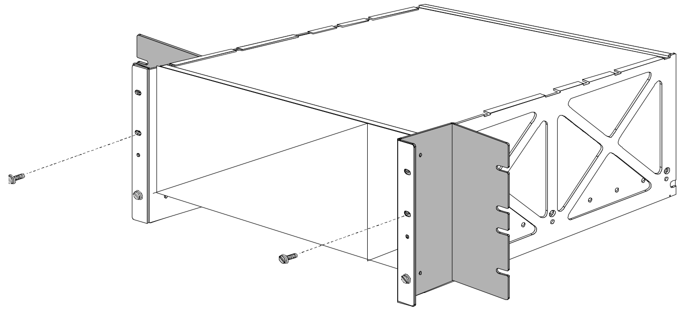
a Insert the two bottom fasteners (screws).

Figure 25 Mid-Mount 23-inch Rack Step 1



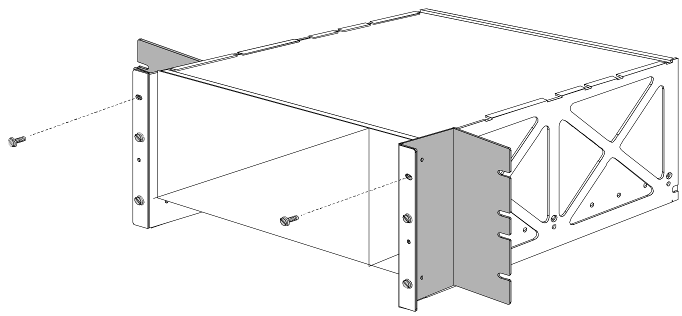
b Insert the two middle fasteners (screws).

Figure 26 Mid-Mount 23-inch Rack Step 2



c Insert the two top fasteners (screws).

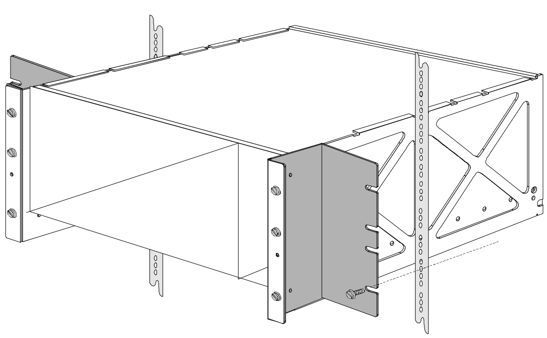
Figure 27 Mid-Mount 23-inch Rack Step 3



3 Secure the extender brackets and chassis to the mounting rails of the rack.

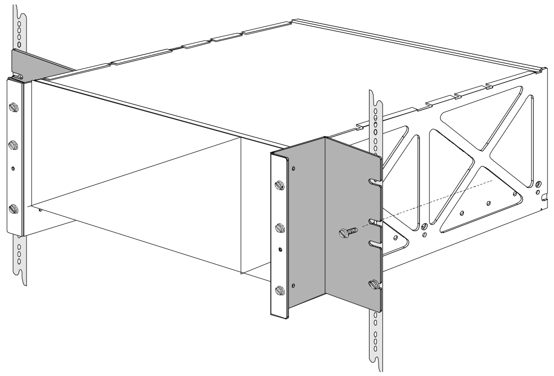
a Insert the two bottom fasteners (screws).

Figure 28 Mid-Mount 23-inch Rack Step 4



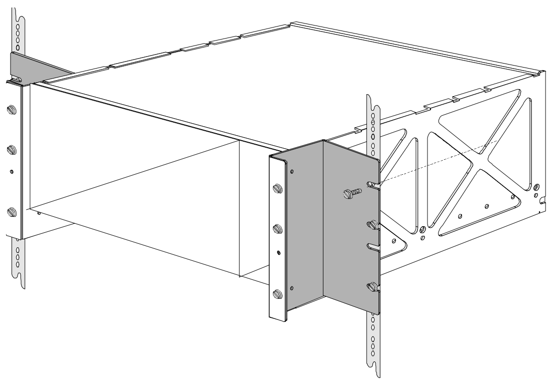
b Insert the two middle fasteners (screws).

Figure 29 Mid-Mount 23-inch Rack Step 5



c Insert the two top fasteners (screws).

Figure 30 Mid-Mount 23-inch Rack Step 6

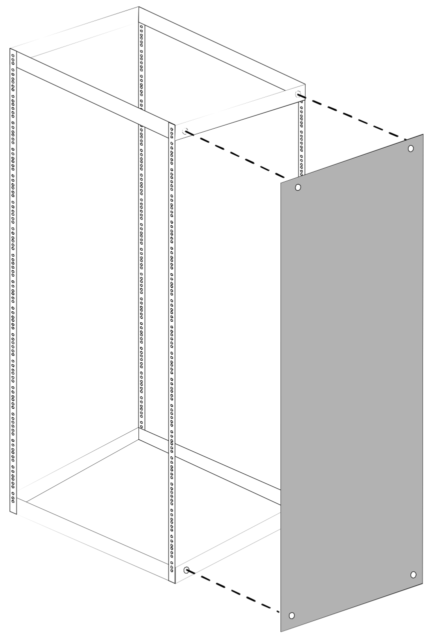


4 Re-install the fan tray; refer to the appropriate installation of the tray fan chapter.

Rear-mount To rear-mount the chassis in a 23-inch rack:

1 Remove the equipment rack sides.

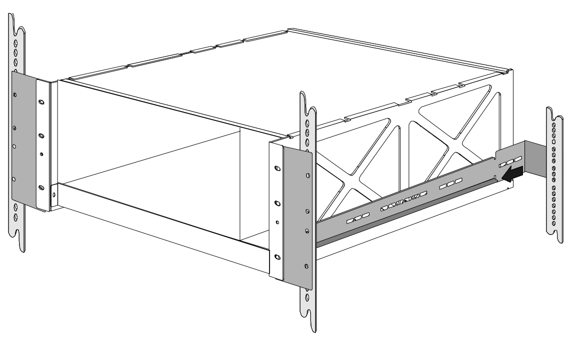
Figure 31 Rear-Mount 23-inch Rack Step 1



2 Install the chassis; refer to the Installing a Chassis in a 23-inch Rack section.

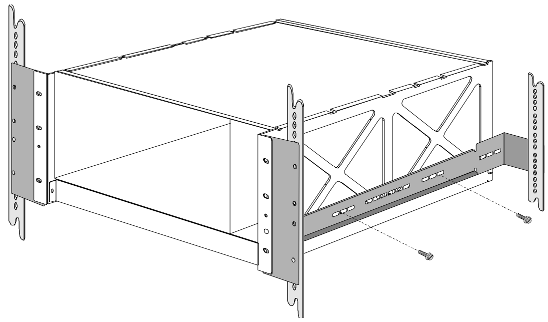
3 Slide the rear-mounting bracket into the back of the rack. Line the bracket mounting holes with the threaded mounting holes on the chassis side, ensuring the bracket rear mounting flange meets the rack rear mounting rail.

Figure 32 Rear-Mount 23-inch Rack Step 2



4 Secure the bracket to the chassis.

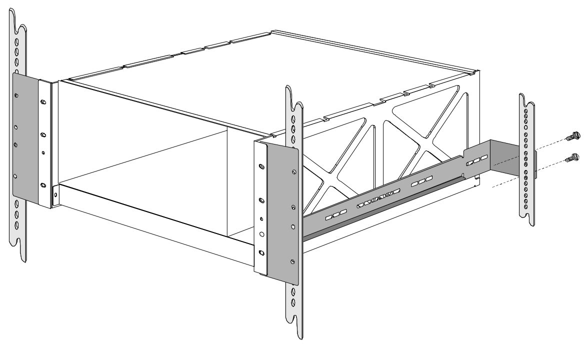
Figure 33 Rear-Mount 23-inch Rack Step 3



5 Repeat *Step 3* and *Step 4* for the other side of the chassis.

6 Secure the bracket rear-mounting flanges to the rack rear mounting rails.

Figure 34 Rear-Mount 23-inch Rack Step 4



Installing the Optional Chassis Door

To install the optional chassis door follow these steps:

1 Push in the two spring loaded pivot pins located at the bottom of the door.

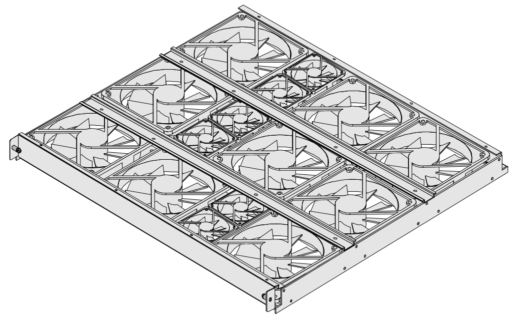
2 Align the pins with matching holes found on the side of the chassis and release them so they lock securely into place.

3 Secure the door closed by using the slide latches found at the top of the door.

AC Fan Tray Installation

The chassis integrated fan tray is factory-installed. Located at the bottom of the chassis, each fan tray has 15 individual fans. Screws are located on the front of the tray and must remain fastened during chassis operation.

Figure 35 AC Fan Tray

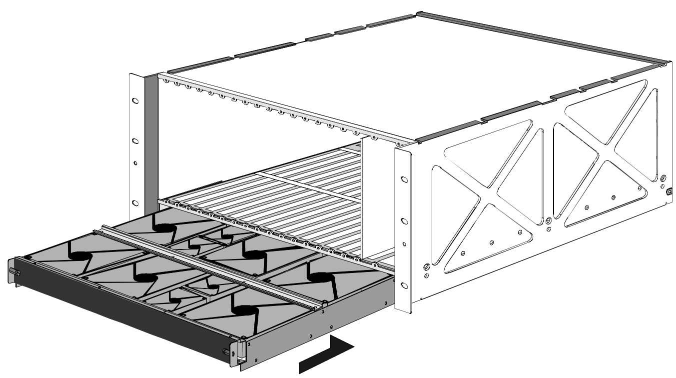


WARNING: *Do not operate a loaded chassis without the fan tray. Doing so even for short periods of time can potentially cause thermal shutdown.*

To install the fan tray:

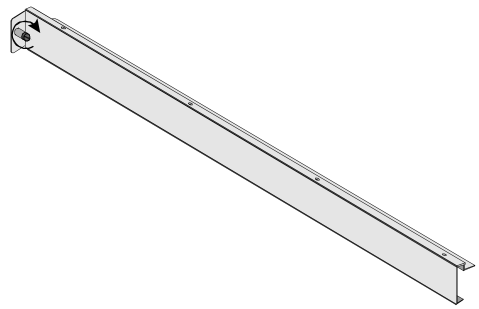
1 Insert the fan tray into the front of the chassis. Slide the fan tray along the guide rails until it is snug against the rear of the chassis. For best results keep the fan tray level with the guide rails.

Figure 36 AC Fan Tray Installation Step 1



2 Tighten the two screws at the front of the chassis.

Figure 37 AC Fan Tray Installation Step 2

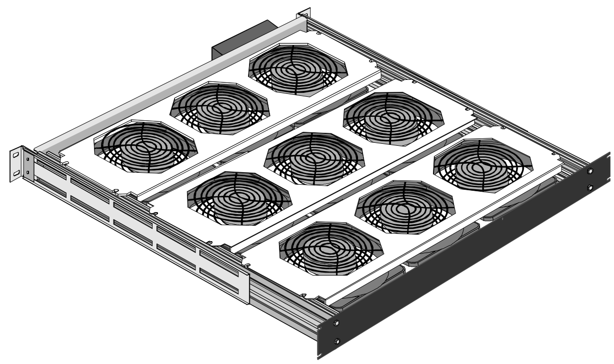


DC Fan Tray Installation

The DC fan tray contains nine 4½-inch axial fans that provide approximately 108 cfm ventilation. There are three fans within each adjustable sliding fan mounting chassis that can be adjusted to redirect upward airflow, although factory configuration should be appropriate.

The tray comes completely assembled, and is designed with adjustable rear support brackets for easy installation on mounting rails in standard 19-inch EIA cabinets.

Figure 38 DC Fan Tray



WARNING: *Do not operate a loaded chassis without the fan tray. Doing so even for short periods of time can potentially cause thermal shutdown*

The DC fan tray can be installed from either the front or the rear of the cabinet. This procedure describes the front-loading method.

To install the DC fan tray:

1. At the front of the cabinet where the fan tray is to be installed, unscrew and remove the screws from the vertical mounting rails.
2. Unscrew and remove the fan tray rear support brackets.
3. Insert the fan tray into the front of the cabinet. Slide the fan tray into the cabinet, until the front of the fan tray is flush with the front of the cabinet.

4 Secure the fan tray to the front vertical mounting rails of the cabinet.

5 Secure the adjustable rear support brackets to the rear vertical mounting rails of the cabinet.

Figure 39 shows the DC fan tray.

Figure 39 DC Fan Tray Diagram

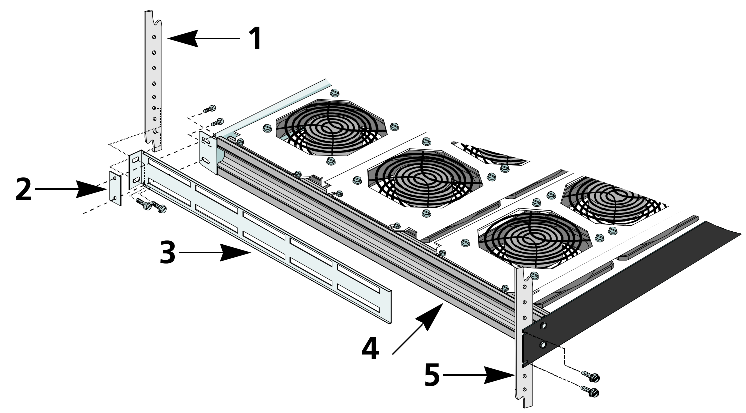


Table 4 lists the callouts in Figure 39.

Table 4 DC Fan Tray Callouts

Callout	Description
1	Cabinet Rear Mounting Rail
2	Nut Plate
3	Rear Support Bracket
4	Side Rail
5	Cabinet Front Mounting Rail

DC Cabling

The DC fan tray comes with two jumper cables connected by ring lugs to its rear panel. These cables connect to the rear panel of the DC chassis, in order to power the devices in parallel.

CAUTION: *Complete all connections at the rear of the chassis and fan tray before cabling the chassis to the DC power source. The fan tray is powered continuously—unless the power source is turned off or disconnected—once the chassis is cabled to the power source.*

To cable the DC fan tray:

1 Confirm that the power is off (“0”) position.

2 Remove plastic cover over terminals.

3 Perform the following connections:

a Connect the red cable to the common terminal.

b Connect the black cable to the -48 VDC terminal.

4 Replace the plastic cover over the terminal block.

CAUTION: *Safety requirements stipulate that the plastic cover be replaced over the terminals after any connections are made.*

International Fan Tray Installation

The international fan tray contains nine 4½-inch axial fans that provide approximately 110 cfm ventilation. There are three fans within each adjustable sliding fan mounting chassis that can be adjusted to redirect upward airflow, although factory configuration should be appropriate.

The tray comes completely assembled, and is designed with adjustable rear support brackets for easy installation on mounting rails in standard 19-inch EIA cabinets.

Figure 40 International Fan Tray

WARNING: *Do not operate a loaded chassis without the fan tray. Doing so even for short periods of time can potentially cause thermal shutdown.*

To install the international fan tray:

The international fan tray can be installed from either the front or the rear of the cabinet. This procedure describes the front-loading method.

Figure 41 is a schematic of the fan tray and the mounting items.

Figure 41 Fan Tray and Mounting Items

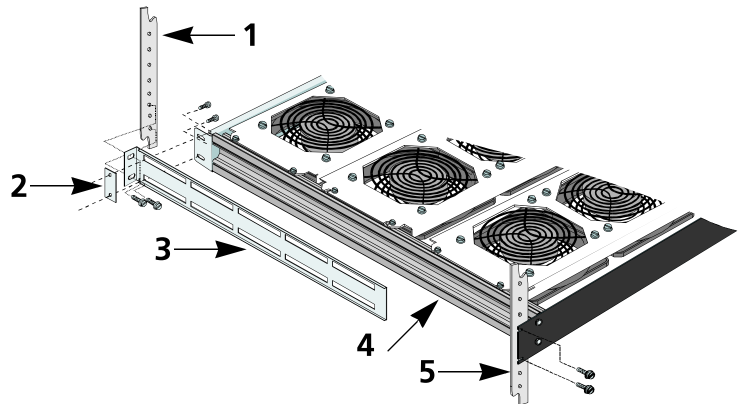


Table 5 lists the callouts in Figure 41.

Table 5 Fan Tray and Mounting Items

Callout	Description
1	Cabinet Rear Mounting Rail
2	Nut Plate
3	Rear Support Bracket
4	Side Rail
5	Cabinet Front Mounting Rail

1 At the front of the cabinet where the fan tray is to be installed, unscrew and remove the screws from the vertical mounting rails.

2 Unscrew and remove the fan tray rear support brackets.

3 Insert the fan tray into the front of the cabinet. Slide the fan tray into the cabinet, until the front of the fan tray is flush with the front of the cabinet.

4 Secure the fan tray to the front vertical mounting rails of the cabinet.

5 Secure the adjustable rear support brackets to the rear vertical mounting rails of the cabinet.

Removing the Fan Tray

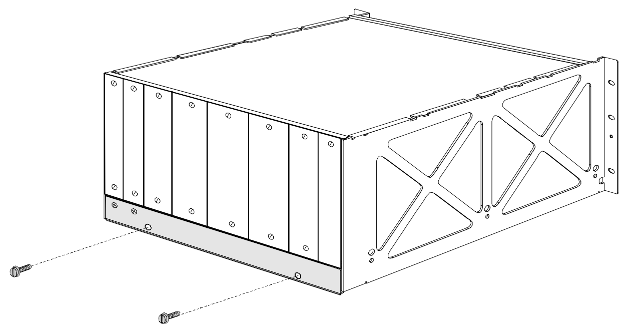
To remove the fan tray:

The fan tray can be removed while the chassis is powered—it is fully hot-swappable.

WARNING: *The individual fans may continue to spin as you remove the tray. Grip the sides of the fan tray, and do not touch the individual fans until they have stopped spinning.*

1 Remove the shipping screws located at the rear of the chassis.

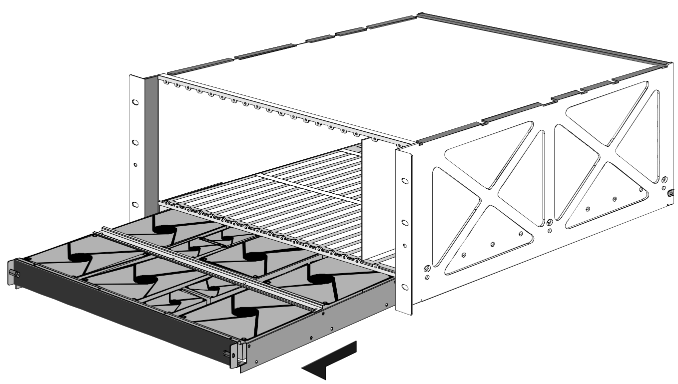
Figure 42 Shipping Screws at Rear of Chassis



2 Loosen the two fan tray screws at the front of the chassis.

3 Remove the fan tray by sliding it toward the front of the chassis. Keep the tray level during removal—do not tilt.

Figure 43 Removing Fan Tray



WARNING: *The individual fans may continue to spin as you remove the tray. Grip the sides of the fan tray, and do not touch the individual fans until they have stopped spinning.*

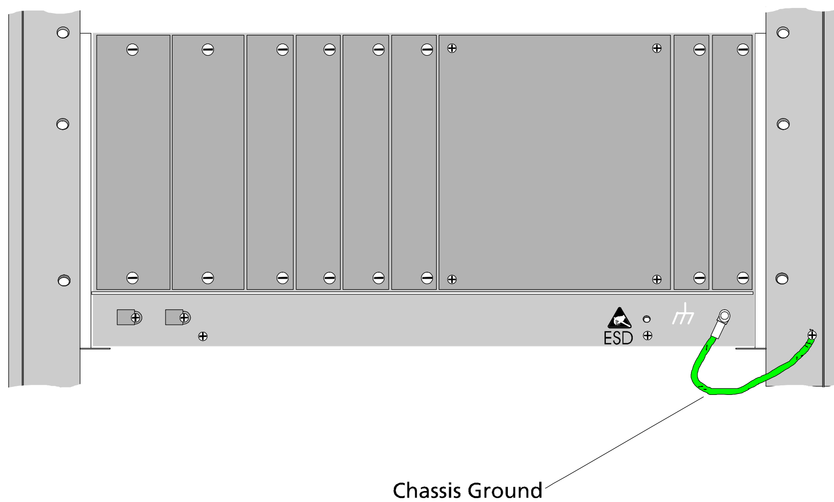
Constructing a Chassis Earth Ground

The Total Control 1000 chassis can be connected to an earth ground through one of the following methods.

The chassis ground can be connected to an equipment frame which is earth grounded or the chassis can be directly connected to an earth ground contact other than the equipment frame. This guide only describes how to connect a chassis to an earth grounded equipment rack.

WARNING: *Failure to install proper grounding may cause personal injury and or damage to equipment.*

Figure 44 Chassis Ground



Do not use different metals for conductors, crimp connections, or other connection devices and use AWG#10 copper wire to construct the earth ground conductor

To connect a chassis to an earth grounded equipment rack:

1. After the chassis is installed in the equipment rack, remove the chassis ground nut.
2. Scrub unplated connections on both ends to a bright finish before establishing any connection.
3. Apply an anti-oxidant to bare conductors on both ends of the grounding wire before establishing any connection.
4. Fasten the grounding wire connector to the chassis by reinstalling the ground nut.
5. Remove the nut on the equipment rack earthing stud or remove the screw in the equipment rack earthing set hole, depending on your configuration.

6 Fasten the ground wire connector on the other end of the ground wire to the earthing stud or earthing screw on the equipment rack.

Install only one connector attachment per earthing stud.

Figure 45 Grounding using Earthing Screw

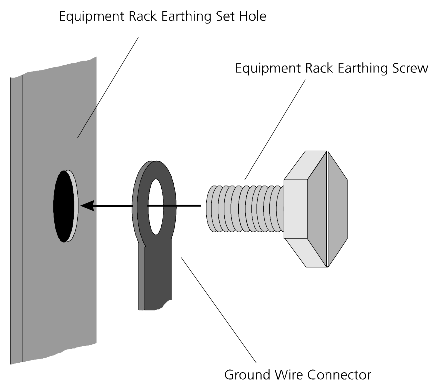
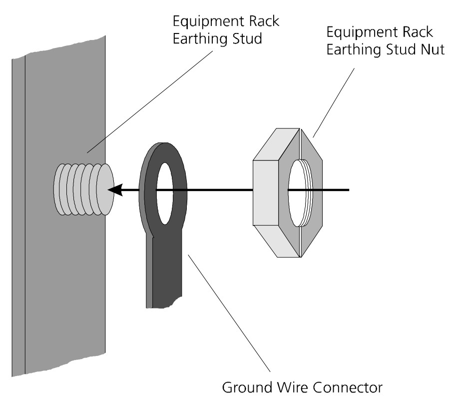


Figure 46 Grounding using Earthing Stud



Install two-hole-compression connectors for connections to flat surfaces.

For a list of fastening materials to use in earthing conductor construction, consult the appropriate safety agency (or equivalent).

3 INSTALLING AND REMOVING POWER SUPPLIES

This chapter explains how to install and remove the Power Supply Units (PSU) and Power Supply Interfaces (PSI) in the CommWorks Total Control® 1000 chassis.

This chapter contains the following topics:

- Overview
- Installing Power Supply Units
- Installing Power Supply Interfaces
- Removing Power Supply Units
- Removing Power Supply Interfaces
- Cabling the DC Chassis
- Powering the Chassis

For assistance in troubleshooting the PSU or the PSI card refer to Appendix A, Trouble Locating and Clearing.

For the technical specifications for this card, refer to Appendix B, Technical Specifications.

Overview

The Total Control 1000 chassis power supplies convert AC or DC input to the required DC voltages used by network application cards (NACs) and network interface cards (NICs). Each chassis can support two PSU/PSI sets for redundancy and load sharing. A power supply consists of a two card set:

- One front-loaded PSU
- One rear-loaded PSI

Color-coded Label

Each card of the PSU/PSI set must have a color-coded label designating the type code for the units. The label is located on the reverse (non-component) side of the PSU or PSI. To assure proper operation of the PSU/PSI set in the Total Control 1000 chassis, the following requirements must be met:

- 70A types and 130A types must not be installed in the same chassis.
- Each PSU and PSI must be installed or removed as a set.
- Each PSU and PSI in the same set must be of the same version.

Since power supplies are available in both AC and DC versions, verify that you have received the correct version by checking the silk-screened labels on the PSU front panel.

A second PSU/PSI set for redundancy is optional, but strongly recommended in a fully loaded chassis.

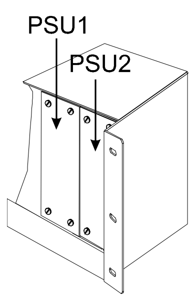
Installing Power Supply Units

To install the PSU in the Total Control 1000 chassis:

ESD: *To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the PSU.*

1 Use the #2 Phillips screwdriver to remove the safety panels covering the PSU slots. Remove the second slot cover for one PSU, remove the first and second slot cover for two PSUs as shown in the graphic below.

Figure 47 Safety Panels

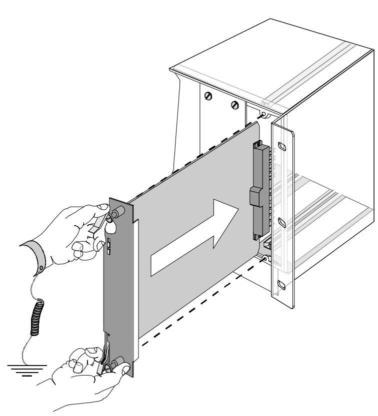


2 Insert the PSU between the upper and lower card guides of the PSU 1 or PSU 2 slot.

a Lift the ejector tabs at the top and bottom of the PSU front panel.

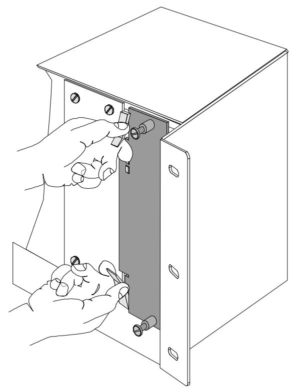
b Slide the PSU into the chassis until the front of the PSU is flush with the chassis.

Figure 48 Sliding the PSU



c Close the ejector tabs.

Figure 49 Closing the Ejector Tabs



d Use a flat-head screwdriver to tighten the screws on front panel to secure unit.

Safety agencies require that the PSUs be secured to the chassis.

WARNING: *To reduce the risk of electric shock, reinstall safety panels over unused PSU slots.*

3 Install the PSI that corresponds to the PSU. Refer to Installing Power Supply Units for more information.

4 Installed according to the instructions provided in the *Installing Power Supply Interfaces* section of this chapter.

Installing Power Supply Interfaces

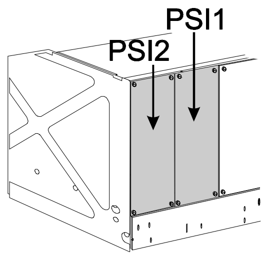
To install the Power Supply Interfaces (PSI)s in the Total Control 1000 chassis:

ESD: *To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the PSI.*

CAUTION: *The PSI must be installed behind a PSU of the same type.*

1 Use the #2 Phillips screwdriver to remove the safety panels covering the slots the PSI is being installed in. Remove the second slot cover for one PSU, remove the first and second slot cover for two PSUs as shown in the graphic below.

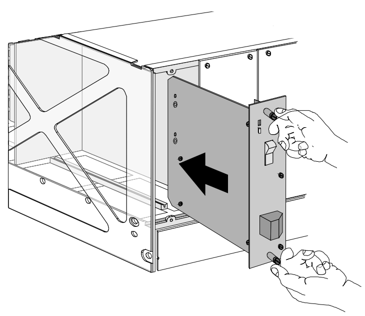
Figure 50 Removing The Safety Panels



2 Insert the PSI between the upper and lower card guides of the PSI 1 or PSI 2 slot.

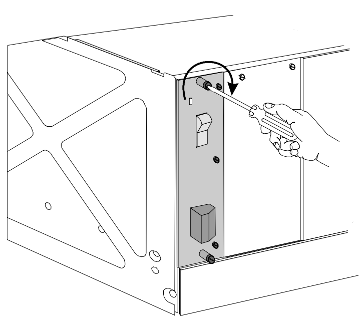
3 Slide the PSI into the chassis until the front of the PSI is flush with the chassis.

Figure 51 Sliding the PSI



4 Use a flat-head screwdriver to tighten the screws on the rear panel to secure unit.

Figure 52 Tightening the Screws



Safety agencies require that the PSIs be secured to the chassis.

WARNING: *To reduce the risk of electric shock, reinstall safety panels over unused PSI slots.*

Removing Power Supply Units

To remove Power Supply Units (PSU)s from the Total Control 1000:

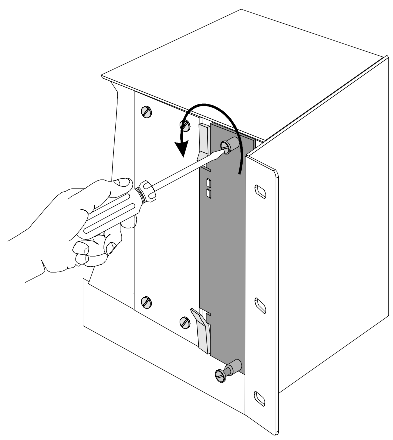
ESD: *To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the PSU.*

1 Remove the PSI corresponding to the PSU being removed according the *Removing Power Supply Interfaces* section of this chapter.

WARNING: *Wait 10 seconds after power has been removed from the PSU/PSI set to allow all capacitors on the cards discharge. Do not touch the PSI/PSU during this period. After 10 seconds the Run/Fail (RN/FL) LED turns off and the PSU can be removed. Some components may still be very hot. Use caution when handling the PSI.*

2 Use a flat-head screwdriver to loosen the screws on the rear panel of the PSU.

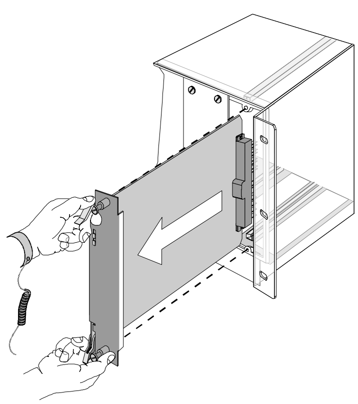
Figure 53 Loosening the Screws on the PSU



3 Lift the ejector tabs at the top and bottom of the PSU's front panel.

4 Slide the PSU out of the chassis.

Figure 54 Sliding the PSU



Removing Power Supply Interfaces

To remove PSIs from the Total Control 1000 chassis:

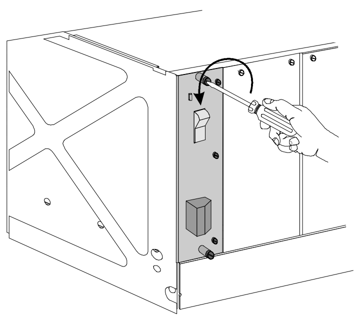
ESD: *To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the PSI.*

1. Turn off the power source.
2. Turn the power switch of the PSI being removed to the off (0) position.

WARNING: *Wait 10 seconds to allow all capacitors on the PSI to discharge. Do not touch the PSI during this period. After 10 seconds the Run/Fail (RN/FL) LED turns off and the PSI can be removed. Some components may still be very hot. Use caution when handling the PSI.*

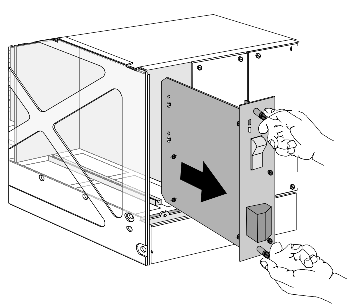
3. Use a flat-head screwdriver to loosen the screws on the rear panel of the PSI.

Figure 55 Loosening the Screws of the PSI



4. Grasp the screws and pull the PSI towards you.

Figure 56 Pulling the PSI



5. Detach the power cables from the PSI.
6. Remove the PSU corresponding to the PSI being removed according to the instructions in the *Removing Power Supply Units* section of this chapter.

Cabling the DC Chassis

Input to the DC chassis is through a 5-position terminal block. Each position accepts spade lugs, ring lugs, or direct connection with 12 to 16 gage wire.

ESD: *To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before cabling the chassis.*

To provide power to the DC chassis, connect the DC power source to the terminals on the rear of the chassis:

1 Switch power to the off ("0") position.

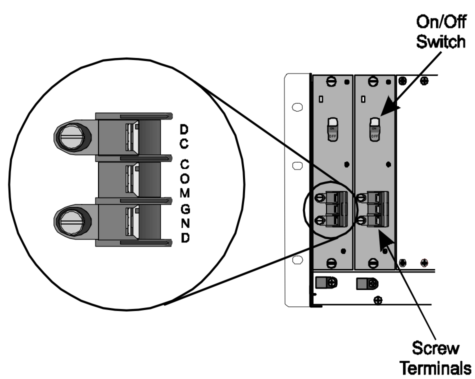
Safety agencies recommend securing the power cables against damage. Use wire tie-wraps starting six inches from the connection to the PSI and every 12 inches thereafter.

The maximum amount of torque which can be applied to the terminal screws is 20 pounds per inch.

2 Remove the plastic cover from the terminal block.

3 Perform the following wire connections:

Figure 57 Wire Connections for DC Chassis



a Connect the common source signal ground to the COM terminal.

b Connect the -48 VDC source signal to the DC terminal.

c Connect the earth ground to the GND terminal.

4 Replace the plastic cover over the terminal block.

CAUTION: *Safety requirements require that the plastic cover be replaced over the terminals and screwed down after any connections are made.*

5 Install the PSI. Refer to Installing Power Supply Interfaces.

Powering the Chassis

Use the following procedures to power the chassis with either an AC PSU/PSI set or DC PSU/PSI set:

AC Chassis

To power the chassis with an AC PSU/PSI set:

ESD: *To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before cabling the chassis.*

Each AC PSU and PSI combination ships with its own power cord. If using two PSU/PSI combinations in the chassis, two power cords are required.

1 Confirm the chassis power switch is in the off (“0”) position.

2 Plug the AC power cord into the power connector on the PSI.

To prevent accidental removal of the power cord from the chassis, use the strain reliefs to secure the card.

3 Plug the AC power cord into the AC power supply source.

The AC input voltage version of the PSU and PSI combination has a wide range input voltage capabilities and can accept any voltage between 90 and 264 VAC.

Each PSU and PSI has LEDs that indicate if the power is on. The PSU has an additional Light Emitting Diode (LED) indicating operational status of the PSI.

Figure 58 PSU and PSI LEDs

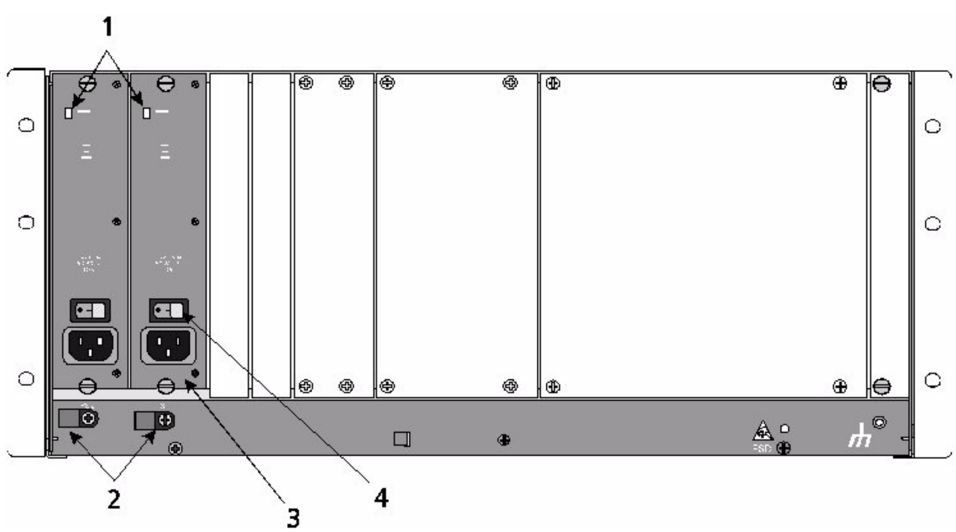


Table 6 references the PSU and PSI LEDs graphic Figure 58.

Table 6 LED Indicators

Call Out	Description
1	RN/FL LEDs
2	Power Cord Strain Reliefs
3	IEC Power Connector
4	On/Off Switch

4 Turn the chassis power switch to the on (“1”) position.

5 Check the indicator lights on each installed PSUs front panel and PSI rear panel. A green light indicates proper operation. If there is no light, the light is solid red, or flashing red, there is an error. Refer to Appendix A, Trouble Locating and Clearing for more information.

DC Chassis

To power-up a chassis with a DC PSU/PSI set:

Confirm that the DC chassis is wired properly. See the Cabling the DC chassis section for explanation.

1 Turn the chassis power switch to the on (“1”) position.

2 Check the indicator lights on each installed PSUs front panel and PSI rear panel. A green light indicates proper operation. If there is no light, the light is solid red, or flashing red, there is an error.Refer to Appendix A, Trouble Locating and Clearing for more information.

II

NETWORK MANAGEMENT CARD

Chapter 4 Network Management Card Overview

Chapter 5 Installing the Network Management Card Set

Chapter 6 Initial Configuration—Network Management Card

4 NETWORK MANAGEMENT CARD OVERVIEW

This chapter provides an overview of the network management card.

This chapter contains the following topics:

- Product Description
- Basic Applications
- Product Compatibility

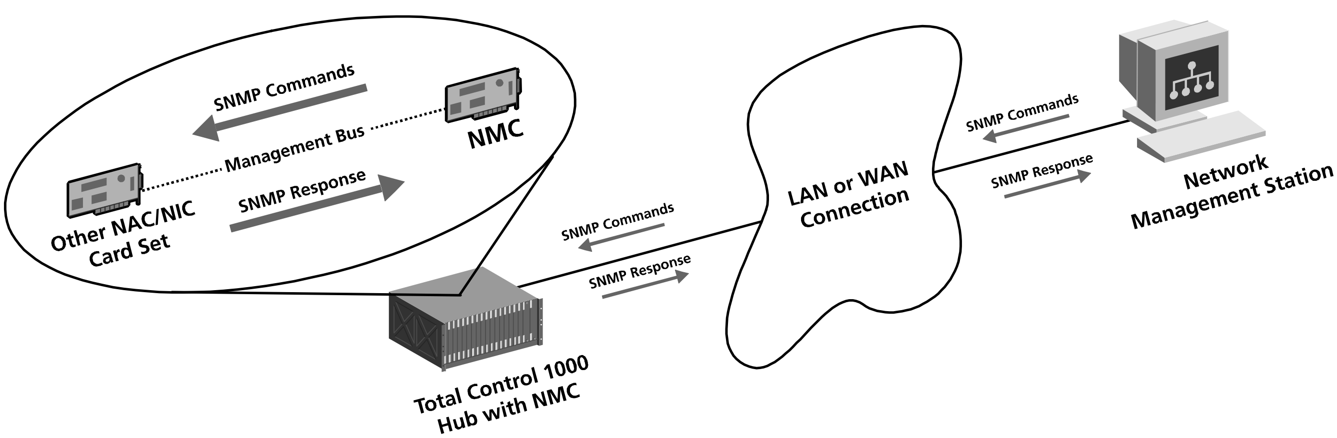
Product Description

The network management card provides a single point of management access into the Total Control® 1000 chassis. It manages all of the devices installed in the Total Control 1000 chassis and operates under the direction of management software running on a workstation known as the network management station.

Introduction

The network management card is part of the communication interface between the network management station and other managed cards within the Total Control 1000 chassis. This section describes two types of communication protocols that are used by the network management card. Refer to the following system level diagram for more information on management communication.

Figure 59 Communication through the Network Management Card



Two protocols are used to implement management functions:

- Simple Network Management Protocol (SNMP), a protocol between the network management card and the network management station.
- Management Bus Protocol (MBP), a protocol between the network management card and the managed devices.

Simple Network Management Protocol

The network management card communicates with the network management station through SNMP. The network management card acts as a proxy agent for other NACs in the chassis that are not running an SNMP agent directly.

The network management card receives requests from the network management station. These requests are articulated by Management Information Bases (MIBs) and are defined for each device in the chassis. In this capacity, the network management card acts as a proxy agent for the other NACs in the chassis. The network management card then carries out the requests and obtains results using the proprietary CommWorks Management Bus Protocol, and uses SNMP to return the results to the network management station.

Management Bus Protocol

The network management card uses the CommWorks proprietary Management Bus Protocol (MBP) to communicate with the installed chassis devices. The network management card provides these functions within the chassis through MBP:

- NAC configuration management
- Automatic NAC configuration upon installation
- NAC configuration queries
- NAC software download upgrades
- Security and accounting management (RADIUS)
- Performance management
- Fault management

Scalability

Since both the hardware and software are scalable, any volume increase in the network is addressed by reconfiguring the software or upgrading the hardware to create a more powerful server.

The network management card architecture supports an increased modem port density. As you add multiple DSP multispan NACs to your managed chassis, the network management card adapts to the increasing size of the call load.

Card Set

The following section provides information regarding the network management card's physical interfaces and DIP switches.

Physical Interfaces

The network management card front panel contains two types of indicators that are useful for monitoring and troubleshooting: Status light emitting diode (LED) indicators and a four-character LED display.

The status LED indicators are red and green, and are used to indicate status within a chassis environment. The four-character display is used to identify the hub name or number in a multi-chassis environment. You can also use the display for four-character messages.

Figure 60 Network Management Card Physical Interfaces

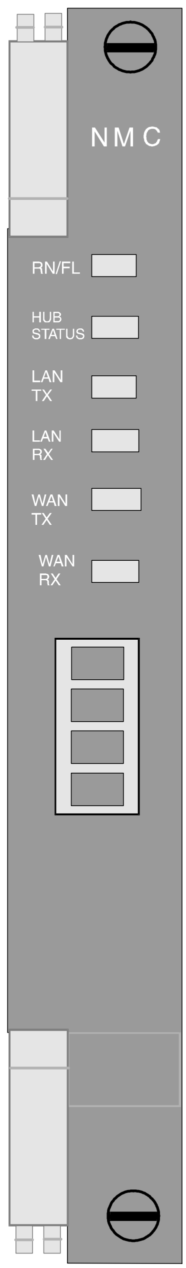


Table 7 references the LEDs in Figure 60 above.

Table 7 Network Management Card Diagnostics

LED	Color	Description
RN/FL	green	Normal/diagnostics mode/boot-up self-test
	flashing green	Testing or software download (required or in process). Also during boot-up sequence.
	red	Critical network management card failure
	flashing red/green	Network management card NIC failure
Hub Status	green	Chassis normal/diagnostics mode
	red	Chassis critical failure
	flashing red	Management bus failure with card in chassis
LAN TX	off	No data being transmitted on Local Area Network (LAN) port
	green	Network management card transmitting data on LAN port
LAN RX	off	No data being received on LAN port
	green	Network management card receiving data on LAN port
WAN TX	off	No data being transmitted on Wide Area Network (WAN) port
	green	Network management card transmitting data on WAN port
WAN RX	off	No data being received on WAN port
	green	Network management card receiving data on WAN port
Four-Character LED Display	N/A	This LED display allows you to label your chassis according to your customized needs (e.g., BLD4, 1000).

Basic Applications

The Total Control 1000 chassis works properly without a network management card. However, the network management card provides several features that make it easier to manage all of the components in your chassis.

While acting as an SNMP agent, the network management card provides security and accounting management for any external RADIUS servers you may have on your network. Also, the network management card allows you to manage card configuration and performance and fault information.

Product Compatibility

The network management card is compatible with these hardware components.

Network Interface Card Compatibility

The network management card is compatible with the 10/100 Ethernet AUX I/O Network Interface Card (NIC).

Total Control 1000 Compatibility

The network management card supports:

- Total Control 1000 access router card
- Total Control 1000 DSP multispan
- Total Control 1000 DS-3 card
- Total Control 1000 SDH STM-0 card
- Total Control Manager
- Common Element Manager

Software Compatibility

Make sure you have the correct software version installed on your network management card. Older software versions are not compatible with the Total Control 1000 network management card.

Refer to the "Total Control Software Compatibility Matrix" found on CommWorks's Technical Support website - http://totalservice.commworks.com - to check software compatibility. If you have a new network management card, the most current software has already been installed on your card.

To download the most current software version, use the Software Download-2 (SDL-2) utility refer to the *Maintenance Guide* for installation instructions.

5 INSTALLING THE NETWORK MANAGEMENT CARD SET

This chapter contains installation requirements, procedures, and verification for the network management card.

This chapter contains the following topics:

- Installation Procedure
- Network Cabling
- Installation Verification

For assistance in troubleshooting the network management card refer to Appendix A, Trouble Locating and Clearing.

For the technical specifications for this card, refer to Appendix B, Technical Specifications.

Installation Procedure

This section explains how to install the network management card Network Application Card (NAC) and 10/100 Ethernet AUX I/O Network Interface Card (NIC) set.

NIC Installation

To install this NIC:

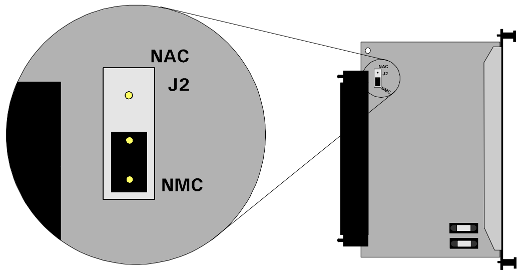
ESD: To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the NIC.

Install the NIC with or without power applied to the chassis.

1 Configure the NIC through jumpers. The NIC should be factory preset to “NMC.”

Verify that the two-pin shunt is placed in the "NMC" position.

Figure 61 Network Management Card Jumper Position

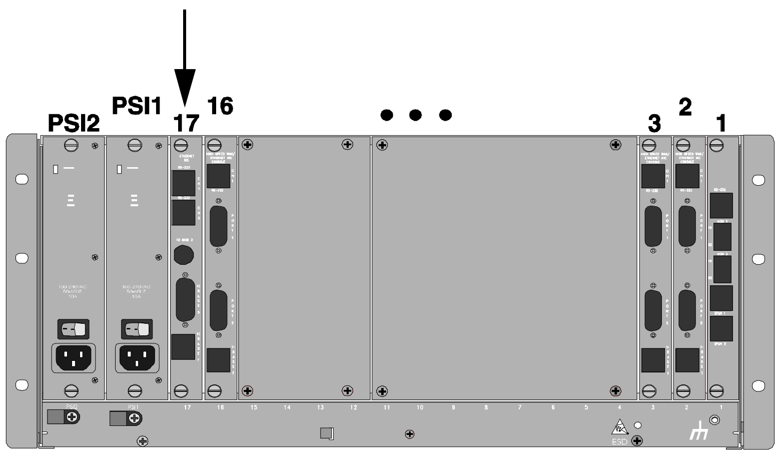


The 10/100 Ethernet I/O NIC only works behind the network management card NAC. The jumper should not be changed from the factory setting.

2 Install the 10/100 Ethernet AUX I/O NIC in slot 17 of the Total Control 1000 chassis.

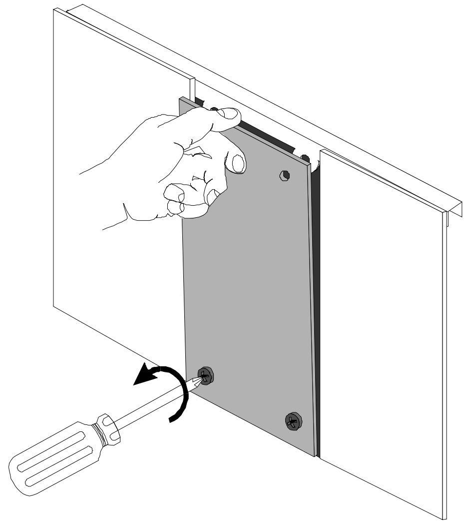
For managed chassis, slot 17 is reserved for the network management card NIC.

Figure 62 Back View of the Total Control Chassis



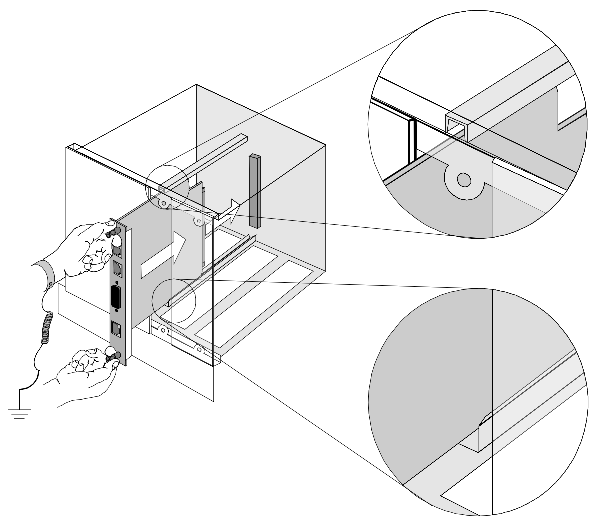
3 Use a #2 Phillips screwdriver to remove the safety panel covering this slot.

Figure 63 Removing the Safety Panel



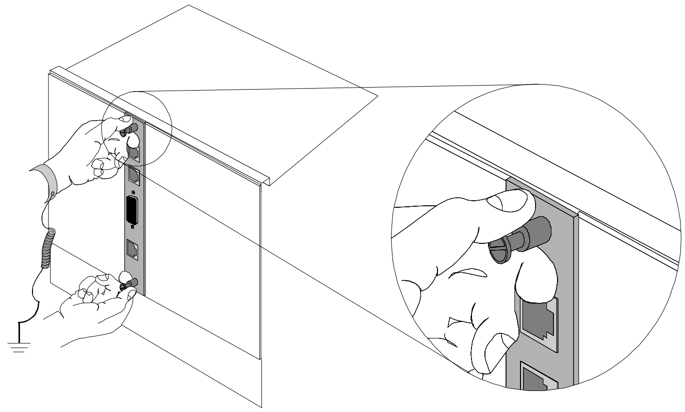
4 Insert the NIC between the slot's upper and lower card guides.

Figure 64 Inserting the NIC



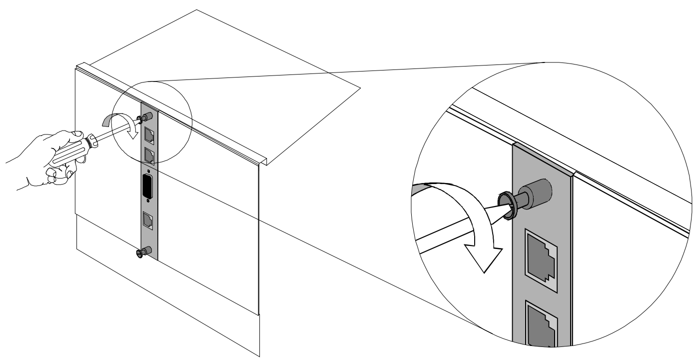
5 Slide the NIC into the chassis, until the front of the NIC is flush with the chassis.

Figure 65 Slide the NIC into the Chassis



6 Use a flat-head screwdriver to tighten the screws on the front panel.

Figure 66 Tighten the Screws



7 Cover any unused chassis slots with safety panels.

8 Install the NAC corresponding to this NIC. Refer to NAC Installation for more information.

NAC Installation

Before you install the NAC card you may want to check to make sure the DIP switches are set to your environment needs. Table 8 lists the factory set default settings.

DIP Switches

To physically configure network management card DIP switches, refer to the following diagram and table. DIP switches one through four are fully configurable using the Command Line Interface (CLI). Refer to Initial Configuration—Network Management Card chapter for more information.

Figure 67 DIP Switch Location

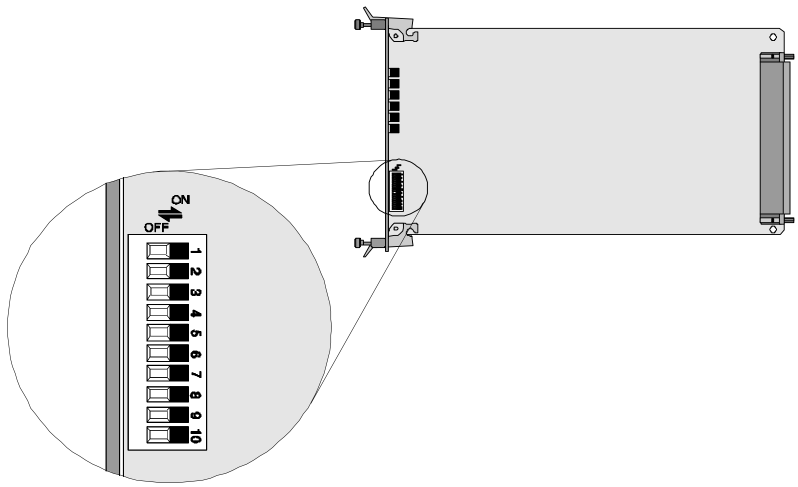


Table 8 references the DIP switches in Figure 67.

Table 8 DIP Switch Configuration

DIP Switch Number	Function		
1, 2	Network management card NIC CLI port rate		
	DIP1	DIP2	Selects
	OFF	OFF	9600 bps*
	OFF	ON	19200 bps
	ON	OFF	38400 bps
	ON	ON	115200 bps
3, 4	Network management card NIC out-of-band management (WAN) port rate		
	DIP3	DIP4	Selects
	OFF	OFF	9600 bps*
	OFF	ON	19200 bps
	ON	OFF	38400 bps
	ON	ON	115200 bps
5	**OFF -** On power-up, network management card loads the chassis configuration from NVRAM.*		
	ON - On power-up, network management card loads the chassis configuration from factory defaults.		

Table 8 DIP Switch Configuration (continued)

DIP Switch Number	Function
6	SLIP over console port (UI) configuration/password enable. **OFF** - SLIP and CLI password are software configurable. Password enable/disable is configurable in CLI mode.* **ON** - SLIP and CLI password are disabled. Operates only in CLI mode with password disabled.
7-9	Reserved for factory use only. Do not change these settings.
10	**OFF** - network management card console redirection disabled.* **ON** - network management card console redirection enabled.
The asterisk (*) denotes the default setting.	

To install this NAC:

ESD: To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the NAC.

Install the NAC with or without power applied to the chassis.

1 Confirm that the NIC corresponding to this NAC is installed. Refer to the *NIC Installation* section for more information.

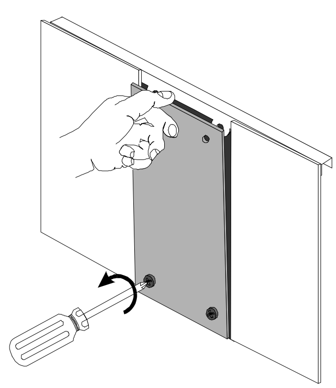
2 Configure the NAC's DIP switches. Refer to the Network Management Card Overview chapter for configuration information.

Verify that the network management card is set to boot from Non-Volatile Random Access Memory (NVRAM). If it is not set to boot from NVRAM, set DIP switch 5 accordingly.

3 Prepare to install the network management card NAC in slot 17. This slot is reserved for the network management card.

4 Use a #2 Phillips screwdriver to remove the safety panel covering this slot.

Figure 68 Removing the Safety Panel



5 Insert the NAC between the slot's upper and lower card guides.

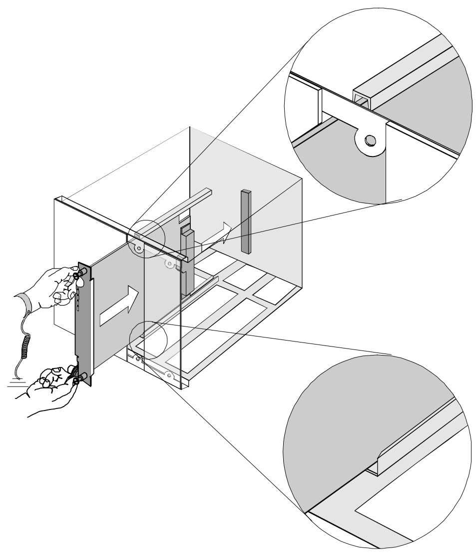


Figure 69 Inserting the Network Application Card

6 Holding the tabs perpendicular to the NAC's front panel, slide the NAC into the chassis, until the front of the NAC is flush with the chassis. Push the tabs toward each other to secure the NAC.

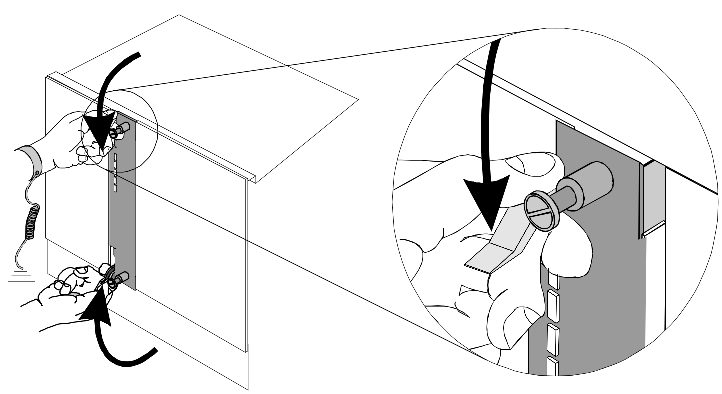
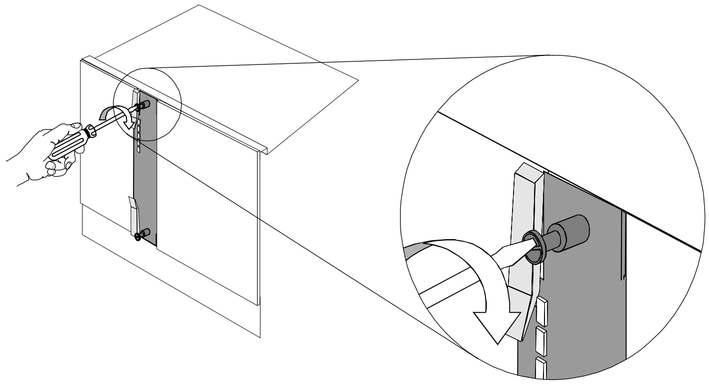


Figure 70 Securing the Network Application Card

7 Use a slotted screwdriver to tighten the screws on the front panel.

Figure 71 Tightening the Front Panel Screws



8 Cover any unused chassis slots with safety panels.

9 Apply power to the chassis, if power is not already applied.

Network Cabling

You can establish a physical connection between your network management station and the network management card in one of two ways.

To access the CLI of the NAC, connect the following cables to the corresponding NIC's console port. You have two cabling options to choose from.

Figure 72 Network Cabling

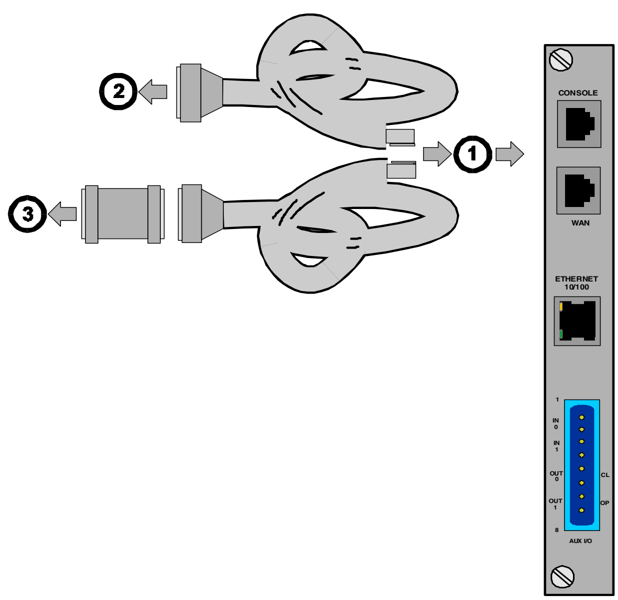


Table 9 references the cabling in Figure 72.

Table 9 Callout Number Descriptions

Callout Number	Description
1	RJ-45 connector to NIC’s console port
2	RS-232 male connector to modem for remote operations
3	RS-232 female-to-female null modem adapter to PC or terminal COM port

Installation Verification

Verify installation by observing the Light Emitting Diodes (LEDs) after installing and powering the NAC and corresponding NIC.

Network Application Card Verification

To verify the installation of the network management card:

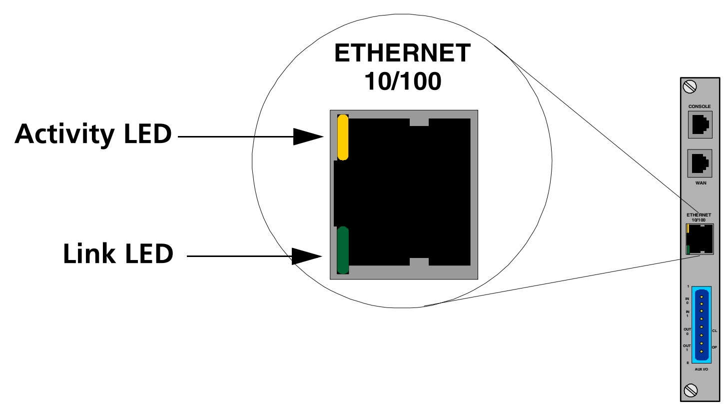
- The RN/FL LED should be solid green.
- If the RN/FL LED does not light, or is solid red or flashing red, there is an error. Refer to Appendix A, Trouble Locating and Clearing for more information.

Network Interface Card Verification

Once you install the network management card and connect the 10/100 Ethernet AUX I/O NIC to a ‘*live*’ Ethernet Local Area Network (LAN), the LED’s on the NIC should show activity.

The Activity LED should flash yellow-green to indicate the port is receiving and transmitting. The Link LED is a solid green to indicate a connection is established and the NIC is receiving valid link pulses.

Figure 73 10/100 Ethernet AUX I/O NIC Status LEDs



Refer to Trouble Locating and Clearing for trouble shooting assistance.

6 Initial Configuration—Network Management Card

This chapter provides instructions for the initial configuration of the network management card Network Application Card (NAC) through the Network Interface Card (NIC) RS-232 Command Line Interface (CLI) port. For a complete description of configuring the network management card, refer to the CommWorks Total Control® 1000 Enhanced Data System *Operations Guide*.

Even if you plan to use the Common Element Manager software to manage the chassis, you must use the CLI to complete initial network management card configuration.

Changes made through the CLI do not take effect until the network management card reboots.

This chapter contains the following topics:

- Required Information
- Start-up Procedure
- Accessing the Command Line Interface
- Network Configuration
- Resetting the Network Management Card
- Using Feature Enable

For assistance in troubleshooting the network management card refer to Appendix A, Trouble Locating and Clearing.

For the technical specifications for this card, refer to Appendix B, Technical Specifications.

Required Information

The following information is beneficial for reference when configuring the network management card.

Fill in the values for your system in Table 10 before starting network management card configuration. The default Local Area Network (LAN) and Wide Area Network (WAN) Internet Protocol (IP) addresses and subnet masks are listed for your reference.

Table 10 Initial Configuration Values

Parameter	Default	Required Value
LAN IP address	149.112.209.186	
LAN subnet mask	255.255.255.0	
WAN IP address	192.77.203.65	
WAN subnet mask	255.255.255.192	
Secondary WAN IP address	192.77.203.1	
Secondary WAN subnet mask	255.255.255.192	
Default gateway IP address	149.112.209.254	

Security

The network management card software provides three basic types of security. They are:

- SNMP—this level of security provides read and write security on community strings
- Authorization Station Feature—this level of security allows you to specify one IP address or a range of IP addresses that are valid for the network management card to respond to.
- Hub security—this level of security is provided at the basic hub level. If the user is allowed on the hub, they can access the network management card. This level of security is not controlled by the network management card, however it does exist on the system.

Start-up Procedure

Complete the following steps before you configure the network management card through the CLI:

1. Install the 10/100 Ethernet Aux I/O NIC. Refer to Installing the Network Management Card Set chapter for more information.
2. Install the network management card NAC. Refer to Installing the Network Management Card Set chapter for more information.
3. Power up the chassis by turning the power switch to the on position.
4. Connect the network management card to the local workstation

Accessing the Command Line Interface

This section contains procedures for physically connecting the network management card to a local workstation running terminal emulation software to access the CLI menu.

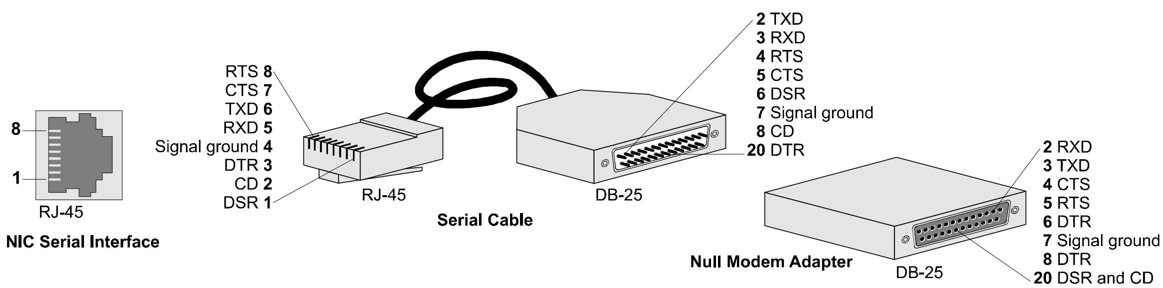
The procedures have two parts:

- Cabling
- Accessing the terminal emulation software

Cabling You must first attach the network management card to your local workstation.

1. Connect the DB-25 (male) end of the cable shown in Figure 74 to the null modem adapter (female) that was supplied in the original packaging.
2. Connect the RJ-45 end of the cable shown in Figure 74 to the console port on the 10/100 network management card Network Interface Card (NIC). The NIC is located in the rear of the Total Control 1000 chassis in slot 17. The console port is the topmost port on the NIC.

Figure 74 Serial Connection Pinouts



3. Connect the null modem adapter directly to a serial port on the computer, or to an EIA-232 cable connected to a serial port on the computer.

Configuring the Serial Port Connection

After you have the cables connected, you must then configure the serial port connection using a terminal emulation software package. A familiar one is HyperTerminal. The examples used in this guide are using HyperTerminal.

1. Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.
2. Configure the serial port.

   Use the information listed in Table 11 to configure the serial port.

Table 11 Console Port Serial Communication Settings

Setting	Variable
Port speed	9600 bps (factory default)*
Data bits	8
Parity	None

Table 11 Console Port Serial Communication Settings (continued)

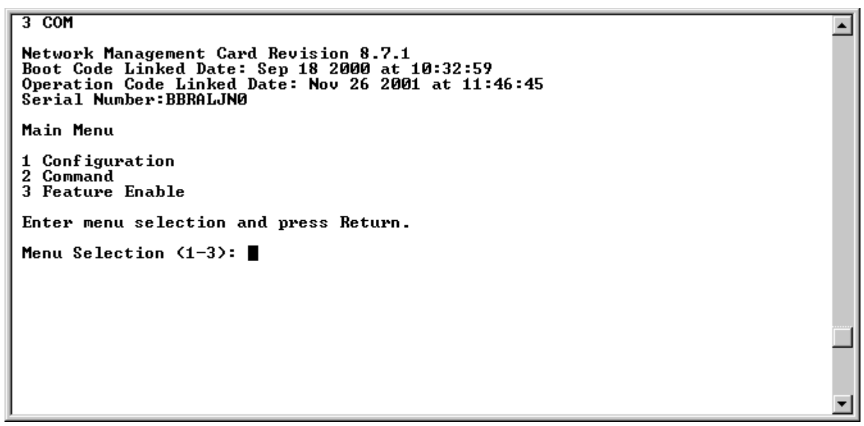
Setting	Variable
Stop bits	1
Flow control	None
Terminal type	VT100

The port speed may have been alter if the DIP switch has been changed during installation of the card. Refer to [*Network Management Card Overview*]() *for information on DIP switch settings.*

3 At the terminal screen, press **Enter** until the network management card's CLI appears with the **Main Menu.**

If the card is secured, you will be prompted for a password. Type your SNMP read-write community string password. The default password is **private**.

Figure 75 HyperTerminal Main Menu



You are now ready to configure the network.

Network Configuration

Initial network management card parameters are values that are mandatory for communicating with the network management card. They include IP addresses and subnet masks.

Refer to the Release Notes to determine the current code needed for the card.

1 From the terminal emulation program, type **1**, then press **ENTER** to access the Configuration menu.

Figure 76 Network Management Card Configuration Menu

```
Configuration

1 Local LAN IP Address
2 Local WAN IP Address
3 Local Gateway IP Address
4 Local Serial Ports Speed
5 Local SNMP Community Strings
6 Local LAN Enable/Disable on Power-up
7 RADIUS Secret Key
8 Reinitialize Authorized Access List
9 Save Configuration To Non-Volatile Memory
10 Enable/Disable Routing between LAN & WAN
11 UI/SLIP Port Selection
12 Local WAN2 IP Address
13 Local INACTIVITY TIME
14 PASSWORD Screen Enable/Disable
15 LED Display

Enter menu selection and press Return or press Esc to exit.

Menu Selection (1-15):
```

2 Type **1**, then press **ENTER** to access the **Local LAN IP Address** menu.

3 Type **1**, then press **ENTER** to access the **LAN IP Address** menu.

Accept the **Current LAN IP Address** by pressing **ESC**.

or

Type the **New LAN IP Address**, then press **ENTER**.

4 Type **2**, then press **ENTER** to access the **LAN IP Subnet Mask** menu.

Accept the **Current LAN IP Subnet Mask** by pressing **ESC**.

or

Type the **New LAN IP Subnet Mask**, then press **ENTER**.

5 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Setting the Local WAN IP Address

To set the Local WAN IP Address:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 Type **2**, then press **ENTER** to access the **WAN IP Address** menu.

Accept the **Current WAN IP Address** by pressing **ESC**.

or

Type the **New WAN IP Address**, then press **ENTER**.

5 Type **2**, then press **ENTER** to access the **WAN IP Subnet Mask** menu.

Accept the **Current WAN IP Subnet Mask** by pressing **ESC**.

or

Type the **New WAN IP Subnet Mask**, then press **ENTER**.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Setting the Local Gateway IP Address

To set the local gateway IP address:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **3**, then press **ENTER** to access the **Local Gateway IP Address** menu.

Accept the **Current Local Gateway IP Address** by pressing **ESC**.

or

Type the **New Gateway IP Address**, then press **ENTER**.

5 Save the configuration to NVRAM by performing theSaving Configuration to Non-Volatile Memory procedure.

Setting the Local Serial Ports Speed

The network management card (333 MHz) has 10 DIP switches located on the NAC which control certain settings and features related to the network management card.

The HiPer network management card does not support this feature.

By default, the network management card's physical DIP switches are disabled, and if you wish to configure the User Interface (UI) and WAN port speeds you must change the DIP switch settings through the CLI or total control manager. The DIP switch settings you configure override any settings that may have been already set by hand.

In general, there are two options when configuring the UI (also known as the console port) and WAN port speeds on the network management card (333 MHz). You can configure the console port speed by altering DIP switch settings through an SNMP software device, or you can manually configure them by pulling the network management card NAC out of the chassis and physically changing the DIP switches to fit your needs.

You can set the local serial port speed using either CLI or total control manager.

Total Control Manager

To configure UI and WAN port speeds through total control manager, use the following procedure.

1. Before configuring UI and WAN port speeds using total control manager, make sure you have an operational network management card with the appropriate software code installed in your chassis.
2. Launch total control manager.
3. From the total control manager Virtual Front Panel Display (VFPD), click the network management card.

   The card turns blue.
4. On the **Main Menu** bar, click **Configure**, and then click **Programmed Settings**.

   The NMC Card Programmed Settings window displays.
5. Click the **Parameter Group** drop-down menu, and select **User Interface Configuration**.

   The current user interface settings for the network management card appears. By default, the **Override Dip Switch** setting is set to **override**. If it is not, use the following procedure to change this setting:

   a. Double-click the **Override Dip Switch** field.

      The drop-down menu displays.

   b. Select **override** from the drop-down menu.

   c. Click **Set** to save the settings.
6. Double-click the **UI Port Speed** field

   The drop-down menu displays.
7. Select the desired UI port speed.

*The port speed settings for both the UI Port Speed and the WAN Port Speed are: **bps9600**, **bps19200**, **bps38400**, and **bps11500**. The default setting for both is **bps9600**.*

8. Click **Set** to save the settings.
9. Double-click the **WAN Port Speed** field.

   The drop-down menu displays.
10. Select the desired WAN port speed.
11. Click **Set** to save the settings.
12. Click **OK**.

Refer to DIP Switches for information on setting the port speed.

If you want to manually configure UI and WAN port speeds using the network management card DIP switches, use the following procedure:

1 Before manually configuring DIP switches, make sure you have an operational network management card with the appropriate software code installed in your chassis.

2 Disable the DIP switch software override by using the following procedure:

a Launch total control manager, and access the desired chassis.

b From the total control manager Virtual Front Panel Display (VFPD), click the network management card.

The card turns blue.

c On the **Main Menu** bar, click **Configure**, and then click **Programmed Settings**.

The NMC Card Programmed Settings window displays.

d Click the **Parameter Group** drop-down menu, and select **User Interface Configuration**.

The current user interface settings for the network management card appear.

e Double-click the **Override Dip Switch** field

The drop-down menu displays.

f Click **notoverride** from the drop-down menu.

g Click **Set** to save the settings.

h Click **OK**.

3 Remove the Network Management card from the chassis and manually configure the DIP switches according to your customized needs.

Command Line Interface

To set the Local Serial Ports Speed using CLI:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

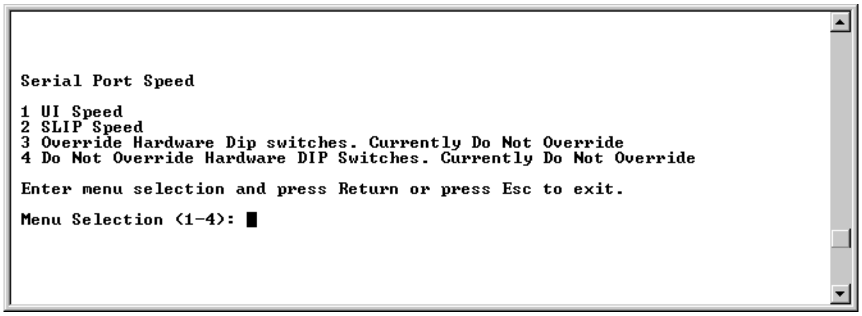
The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **4**, then press **ENTER** to access the **Local Serial Ports Speed** menu.

The following screen appears.

Figure 77 Setting Port Speed



5 Type **1** to change the CLI port speed.

The default is 9600 bps. This menu selection corresponds with DIP switches one and two. Refer to DIP Switches and for more information on port speed options.

6 Accept the current CLI port speed by pressing **ESC**.

or

Type the desired port speed, and press **ENTER**.

7 Type **2** to change the SLIP speed (WAN port speed). The default is 9600 bps. This menu selection corresponds with DIP switches three and four. Refer to Dip

8 Accept the current SLIP port speed by pressing **ESC**.

or

Type the desired port speed, and press **ENTER**.

9 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Refer to DIP Switches for information on setting the port speed.

Setting the Local SNMP Community Strings

To set the Local SNMP Community Strings:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **5**, then press **ENTER** to access the **Local SNMP Community String** menu.

You can configure the community strings for "public" access, which allows read-only access. "Private" access allows read and write access.

5 Accept the **Current Local SNMP Community String** by pressing **ESC**.

or

Type the **New SNMP Community String**, then press **ENTER**.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Enabling or Disabling the Local LAN

To enable or disable the local LAN on power-up:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **6**, then press **ENTER** to access the **Local LAN Enable/Disable on Power-up** menu.

5 Type **1**, then press **ENTER** to enable the local LAN on power-up.

or

Type **2**, then press **ENTER** to disable the local LAN on power-up.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Setting the RADIUS Secret Key

To set the RADIUS Secret Key:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **7**, then press **ENTER** to access the **RADIUS Secret Key** menu.

5 Type the **New RADIUS Secret Key**, then press **ENTER**.

6 Save the configuration to NVRAM by performing the **S**Saving Configuration to Non-Volatile Memory procedure.

Reinitializing Authorized Access List

To reinitialize the Authorized Access List:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **8**, then press **ENTER** to access the **Reinitialize Authorized Access List** menu.

5 Press **ENTER** to reinitialize the authorized access list.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Saving Configuration to Non-Volatile Memory

To save the configuration to non-volatile memory (NVRAM):

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 Type **9** to access the to access the **Save Configuration To Non-Volatile Memory** menu, then press **ENTER** to save you configuration information to NVRAM.

5 Reset the network management card by removing and reseating the card in the chassis.

or

Use the reset command on the network management card **Main Menu**.

6 Access the CLI and check your configuration information.

You cannot save to NVRAM unless the local gateway IP address points to either the LAN or WAN port subnet. You will receive an error message if the IP address is not correct.

Dip switch 5 on the network management card NAC must be set to OFF to save changes to NVRAM. If you ever want to restore factory default settings, set DIP switch 5 to ON.

Enabling or Disabling Routing

To enable or disable routing between the LAN & WAN:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **10**, then press **ENTER** to access the **Enable/Disable routing between LAN & WAN** menu.

5 Type **1**, then press **ENTER** to enable routing between the LAN & WAN.

or

Type **2**, then press **ENTER** to disable routing between the LAN & WAN.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Setting the UI/SLIP Port Selection

To set the UI/SLIP Port Selection:

1 Access the UI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **11**, then press **ENTER** to access the **UI/SLIP Port Selection** menu.

5 Type **1**, then press **ENTER** to select UII.

or

Type **2**, then press **ENTER** to select SLIP.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Setting the Local WAN2 IP Address

To set the Local WAN2 IP Address:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **12**, then press **ENTER** to access the **Local WAN2 IP Address** menu.

5 Type **1**, then press **ENTER** to access the **WAN2 IP Address** menu.

Accept the **Current WAN2 IP Address** by pressing **ESC**.

or

Type the **New WAN2 IP Address**, then press **ENTER**.

6 Type **2**, then press **ENTER** to access the **WAN2 IP Subnet Mask** menu.

7 Accept the **Current WAN2 IP Subnet Mask** by pressing **ESC**.

or

Type the **New WAN2 IP Subnet Mask**, then press **ENTER**.

8 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Setting the Local Inactivity Time

To set the Local Inactivity Time:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **13**, then press **ENTER** to access the **Local INACTIVITY TIME** menu.

5 Type the **INACTIVITY TIME**, then press **ENTER**.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Enabling or Disabling the Password

To enable/disable the password screen:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **14**, then press **ENTER** to access the **PASSWORD Screen Enable/Disable** menu.

5 Type **1**, then press **ENTER** to enable the password.

or

Type **2**, then press **ENTER** to disable the password.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Setting the LED Display

To set the LED display:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **1**, then press **ENTER** to access the **Configuration** menu.

4 From the **Configuration** menu, type **15**, then press **ENTER** to access the **LED Display** menu.

5 Accept the **LED Display** by pressing **ESC**.

or

Type the **LED Display**, then press **ENTER**.

The LED Display can only display 3 characters.

6 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

Resetting the Network Management Card

To reset the network management card:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **2**, then press **ENTER** to access the **Command** menu.

4 Type **1**, then press **ENTER** to reset the network management card.

5 Type **Y** then press **ENTER**.

The network management card resets.

Using Feature Enable

To enable a feature:

1 Access the CLI through a terminal emulation program (e.g., HyperTerminal).

2 Press **ENTER**. If prompted for a password, type your SNMP read-write community string password, then press **ENTER**.

The **Main Menu** appears.

3 Type **3**, then press **ENTER** to access the **Feature Enable** menu.

4 Type the Feature Key, then press **ENTER** to enable the feature.

5 Save the configuration to NVRAM by performing the Saving Configuration to Non-Volatile Memory procedure.

III

ACCESS ROUTER CARD

Chapter 7 Access Router Card Overview

Chapter 8 Installing the Access Router Card Set

Chapter 9 Initial Configuration—Access Router Card

Chapter 10 Initial Configuration—Access Router Card for SS7 Signaling

7 ACCESS ROUTER CARD OVERVIEW

The access router card provides terminal server, remote access and LAN-to-LAN routing services through analog and digital connections in a multi-protocol LAN/WAN networking environment.

This chapter provides an overview of the access router card. It contains the following topics:

- Product Description
- Applications
- Required Information
- Product Compatibility

Product Description

The following section gives a general description of the access router card.

Introduction

The access router card is a multi-protocol, dial-up router and terminal server commonly described as a remote access server. It is a software-based router for incoming call traffic terminated on Digital Signal Processor (DSP) multispan Network Application Cards (NACs). Access router cards receive incoming traffic from DSP multispan cards, encrypt the information and forward this traffic on to various egress ports.

Scalability

Since both the hardware and software are scalable, any volume increase in the network is addressed by reconfiguring the software or upgrading the hardware to create a more powerful server.

External Interfaces

There are several interface types supported by the access router card:

- PCI Bus Interface
- Packet Bus Interface
- Management Bus Interface
- Other related interfaces

PCI Bus Interface

Access router cards use a Peripheral Component Interconnection (PCI) bus to communicate with corresponding Network Interface Cards (NICs), access router daughter cards and all other devices not directly connected to the access router card's processor bus. The PCI bus provides a high-bandwidth, standard interface for the Packet bus controller and NIC input/output controller(s). These controllers are the masters on the PCI bus and arbitrate with the CPU for memory access.

There is also a PCI-to-PCI bridge device between the PCI bus on the access router card and the PCI bus going to its corresponding NIC. These are separated for enhanced performance. You must configure the bridge during the software PCI bus enumeration process. After configuring this bridge, communication to the NIC should be nearly identical to the current communication methods.

Packet Bus Interface

The Packet bus provides the communication path between the access router card and other cards in the CommWorks Total Control® 1000 hub. The Packet bus is the pathway for all call setup and tear down information sent to the access router card.

Management Bus Interface

The access router card contains the same interface to the management bus as previously released versions of the card.

Other Related Interfaces

The access router card is able to originate calls using either analog or digital-ISDN connections. This includes all modes of operation for call origination, including LAN-to-LAN, dialback, roaming dialback, and dial out.

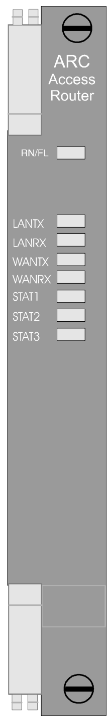
The following list shows some of the most common physical interfaces:

- RS-232 Console using a RJ-45 connector
- Ethernet 10 Base-T using an RJ-45 connector
- Ethernet 100 Base-T using an RJ-45 connector
- Frame Relay through V.35/RS-422/X.21 using a DB-15 connector

LED Indicators

Figure 78 shows the eight Light Emitting Diodes (LEDs) on the access router card's front panel. The LEDs are red, green, and amber and are used to indicate status within a chassis environment. Each LED is explained in detail below.

Figure 78 Access Router Card LEDs



Run/Fail LED

Table 12 lists what the Run/Fail LED signifies except during start-up tests and software downloads.

Table 12 Run/Fail LED

LED	Meaning
Off	Power Off
Green	Power On
Red	Critical Failure

During start-up tests and software downloads, this LED cycles through several colors as described in Table 13.

Table 13 Run/Fail LED for Test and Startup Procedures

LED	Meaning
Red	During start-up Power On Self Test (POST)
Amber (flashing slowly)	Checking for software download
Green (flashing rapidly)	Loading an application into RAM
Green	Normal Operation

LAN TX LED

The LAN TX LED indicates packets are being transmitted through the LAN (Ethernet) interface.

Table 14 LAN TX LED

LED	Meaning
Red	Interface failure
Red (flashing)	Collision (1 plash per error)
Amber (flashing)	Multiple collisions, network busy
Off	Idle

LAN RX LED

The LAN RX LED indicates packets are being received from the LAN (Ethernet) interface.

Table 15 LAN RX LED

LED	Meaning
Red	Interface failure
Red (flashing)	Collision error
Green	Receiving packet
Off	Idle

The front panel LEDs labeled STAT1, STAT2 and STAT3 are not used at this time either.

Applications

The access router card performs basic applications relating to router cards in general. It also has new enhancement applications that were not available in previous versions released for general availability.

Basic Applications

The access router card performs seven basic applications:

- IP Terminal Service
- Network Dial-in Access
- Dial-Out Access
- LAN-to-LAN Routing
- Tunneling
- Packet Filtering
- Administrative Utilities

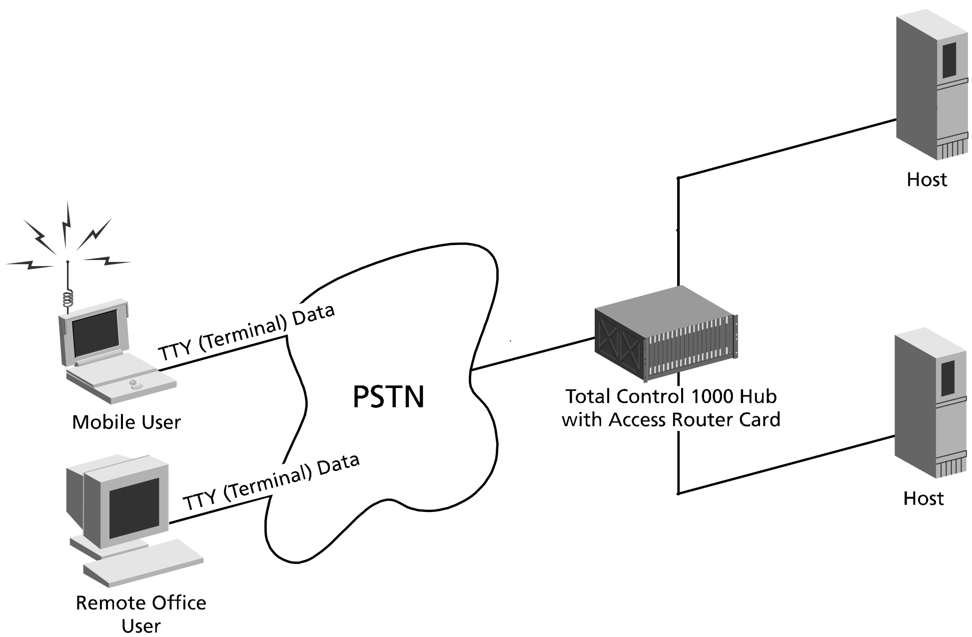
IP Terminal Service

The access router card provides network access for dumb terminals or computers that emulate dumb terminals. This allows remote terminals to log into an Internet Protocol (IP) host on the local network as if they were physically connected to it.

To do this, the access router card receives Teletype (TTY) terminal output over a dial-up line. The ASCII data stream from these remote terminals is converted into a virtual terminal protocol (TELNET or Rlogin) and a session is established with a host to provide an IP terminal service connection on the Total Control 1000 hub's local network. Since the connection is bi-directional, the terminal can also receive the host's responses.

The access router card offers extensive access security, dialback, and substantial configurability for terminal service connections. See Figure 79.

Figure 79 IP Terminal Service Topology



Network Dial In Access

The access router card provides dial-in network access for remote users. Remote users can dial in and attach to the local network as if they were local nodes. These connections can be maintained continuously or established on an on-demand basis and disconnected when not needed.

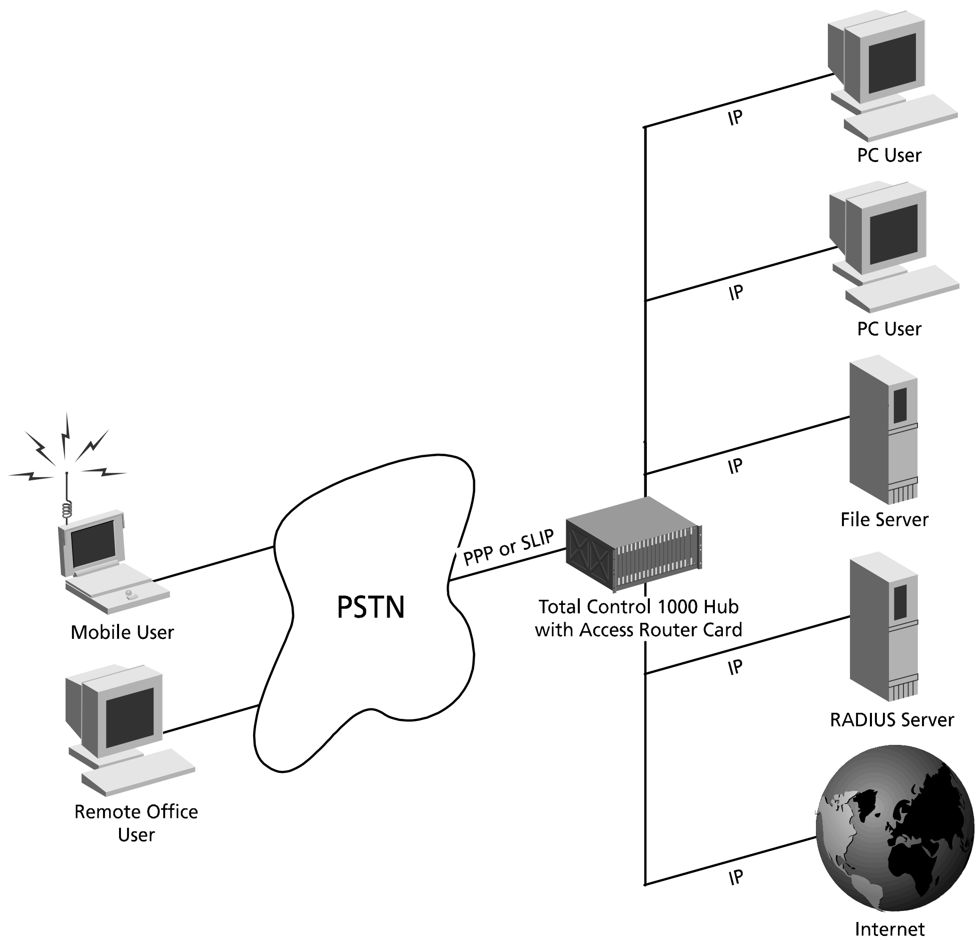
Packets transmitted over the dial-in connection are encapsulated using either of the following protocols:

- Point-to-Point Protocol (PPP)
- Serial Line IP Protocol (SLIP)

When received by the access router card, the packets are forwarded from the remote user to the LAN and back again.

The access router card offers access security, dialback, and substantial configurability for dial-in network connections. See Figure 80.

Figure 80 Network Dial-In Topology



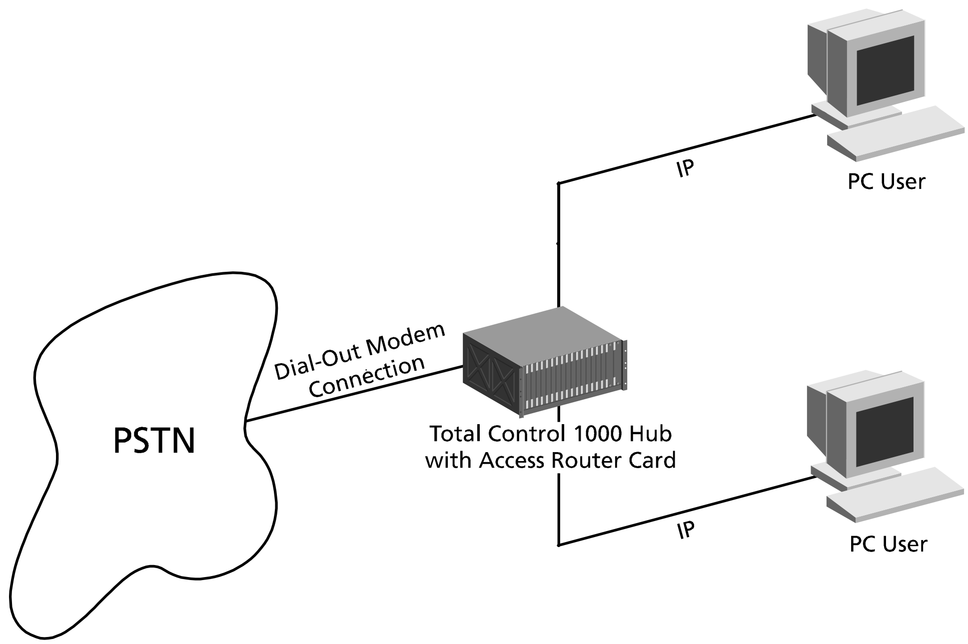
Dial-Out Access

Chassis ports (modems) can be accessed by PCs and workstations on a local IP network to provide dial-out service. The access router card can also create pools of modems that can be used by local hosts on a first-come, first-serve basis.

To do this, the access router card allows the host to establish a virtual terminal session with the modem. The host can then interact with the modem's command line and dial out.

Dial-out service allows network users to send faxes, connect to Bulletin Board Systems (BBS), online information services or access the Internet over a dial-up PPP connection. See Figure 81.

Figure 81 Dial-Out Topology



LAN-to-LAN Routing

The access router card performs dial-up LAN-to-LAN routing over a PPP connection between facilities. This occurs when one device dials up another and logs in as a user. In addition, the access router card supports Frame Relay connections over WAN links. RIP and Open Shortest Path First (OSPF) routing protocols are supported.

Dial-up LAN-to-LAN can be set up in a number of ways: manual, on-demand, timed, or continuous. You can configure connections to use various routing and protocol parameters. The access router card is also capable of establishing additional connections to increase bandwidth automatically when traffic increases.

Tunneling

The access router card supports two largely similar methods of tunneling IP/IPX traffic: the Layer Two Tunneling Protocol (L2TP), an open tunneling protocol, and the Point-to-Point Tunneling Protocol (PPTP), the Microsoft protocol that supports connections to a Windows NT host.

These protocols provide a path and secure environment for PPP sessions over a Virtual Private Network (VPN). By creating a L2TP or PPTP tunnel, the access router card extends a dial-in user's PPP session across a TCP/IP network without granting access to that network. This allows a private network to set up a host with the power to grant or deny access to that user as if the host were the Network Access Server terminating the user's call.

Packet Filtering

The access router card supports IP packet filtering in both the inbound and the outbound directions of ports, users, and dial-out locations.

Administrative Utilities

The access router card's command line includes utilities for troubleshooting connections including:

- The ability to manually dial a location to test connectivity
- The ability to use TELNET, Rlogin or ClearTCP to establish a session with another host from the access router card's command line.
- UNIX-like troubleshooting commands including ping and traceroute for debugging IP connections.

Required Information

The following information is beneficial for reference when configuring the access router card.

System Administrator Requirements

This document assumes you are familiar with IP/IPX networks. TCP/IP information is available from a variety of sources, some of which are described below.

If you require the assistance of a qualified professional, consult your nearest authorized CommWorks reseller for advice. For a service fee, CommWorks also offers qualified engineering assistance on site. Refer to the About This Guide chapter for more information on how to contact CommWorks Customer Services.

TCP/IP Reference Material

The network manager is typically responsible for devising an addressing strategy appropriate for the size and growth potential of the network. We recommend the following reference book for TCP/IP:

Comer, D.E., Internetworking with TCP/IP Volume I: Principles, Protocols and Architecture, Prentice-Hall, Englewood Cliffs, New Jersey, 1995.

You must obtain registered addresses from the Internet's Network Information Center (InterNIC) for IP machines and networks that are attached to the Internet. InterNIC can be contacted at the following address and phone number.

Network Solution
InterNIC Registration Services
505 Huntmar Park Drive
Herndon, VA 20170
1-703-742-4777

The InterNIC Web site is: **http://ds.internic.net**

For networks with only a few IP machines, you may be able to contact your local Internet access provider and let them handle the details.

Product Compatibility

The access router card is compatible with the following hardware components.

NIC Compatibility

The network management card is compatible with the following Network Interface Card (NIC): Dual 10/100 Ethernet NIC

Total Control 1000 Compatibility

The network management card supports the following Total Control 1000 products:

- Total Control 1000 network management card
- Total Control 1000 access router card
- Total Control 1000 DSP multispan
- Total Control 1000 DS-3 card
- Total Control 1000 SDH STM-0 card
- Total Control Manager
- Common Element Manager

Software Compatibility

Make sure you have the correct software version installed on your network management card. Older software versions are not compatible with the Total Control 1000 network management card.

Refer to the “Total Control Software Compatibility Matrix” found on technical Support website - http://totalservice.commworks.com - to check software compatibility. If you have a new network management card, the most current software has already been installed on your card.

8 INSTALLING THE ACCESS ROUTER CARD SET

This chapter contains installation requirements, procedures, and verification for the access router card.

This chapter contains the following topics:

- Product Description
- Installation Requirements
- Installation Procedure
- Cabling
- Installation Verification

For assistance in troubleshooting the access router card refer to Appendix A, Trouble Locating and Clearing.

For the technical specifications for this card, refer to Appendix B, Technical Specifications.

Product Description

The PCI Dual 10/100 Base-T Ethernet Network Interface Card (NIC) provides an Ethernet interface between a Network Application Card (NAC) in the CommWorks Total Control 1000® chassis and your network.

This NIC features two high speed ethernet ports capable of auto-detecting between 10Base-T and 100Base-TX interfaces. In addition, the NIC also features an RS-232 Command Line Interface (CLI) console port.

The Peripheral Component Interconnection (PCI) Dual 10/100 Base-T Ethernet NIC is installed in the rear of the chassis behind its corresponding NAC.

The access router card is also compatible with the following NICs:

- Quad T1/E1 + 10/100 Ethernet NIC
- Dual V.35 +10/100 Ethernet NIC
- Dual ATM DS-3 + 10/100 Ethernet NIC
- Dual ATM E-3 + 10/100 Ethernet NIC

For information on the above NICs refer to the About This Guide chapter.

Installation Requirements

The following section describes requirements necessary to install the access router card.

Network Interface Cards

Before installing the NAC in a Total Control 1000 chassis, the PCI Dual 10/100 Base-T Ethernet NIC must be installed and cabled. Refer to, Installing the Network Management Card Set chapter for more information.

Installation Procedure

This section explains how to install the NIC and NAC set:

NIC Installation

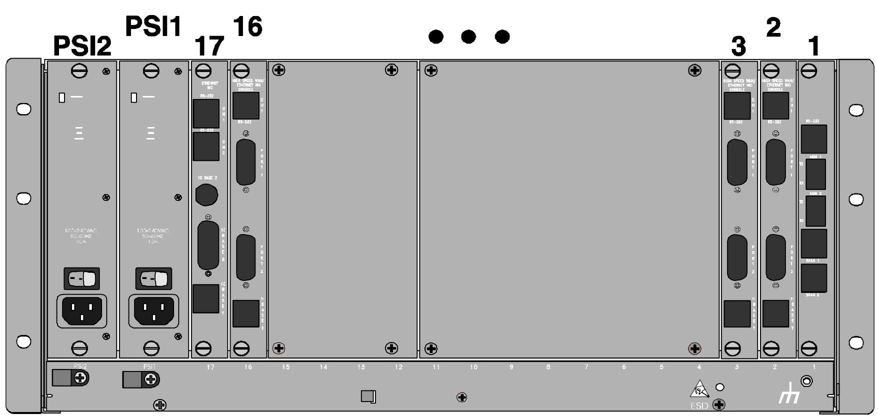
***ESD:** To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the NIC.*

Install the NIC with or without power applied to the chassis.

1. Select a slot at the rear of the Total Control 1000 chassis for installing the NIC.
2. Install this NIC in slot(s): 1–16.

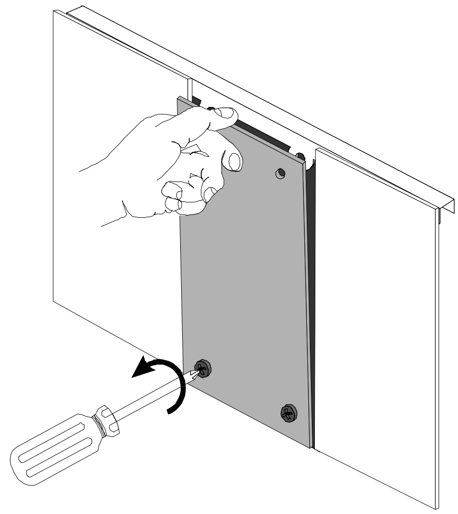
For managed chassis, slot 17 is reserved for the network management card NIC.

Figure 82 Back View of the Total Control 1000 Chassis



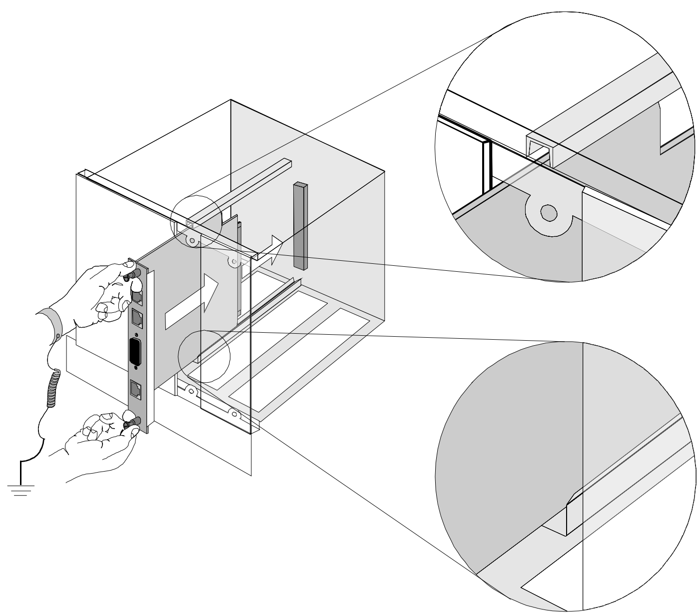
3. Use a #2 Phillips screwdriver to remove the safety panel covering this slot.

Figure 83 Removing the Safety Panel



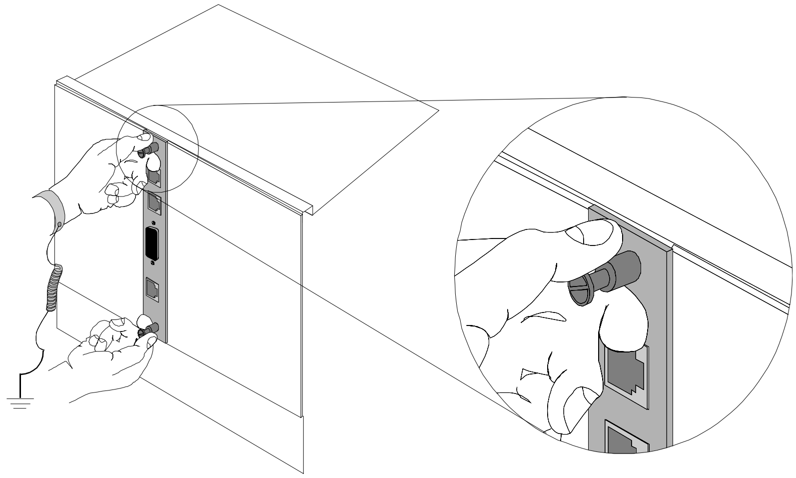
4 Insert the NIC between the slot's upper and lower card guides.

Figure 84 Inserting the NIC



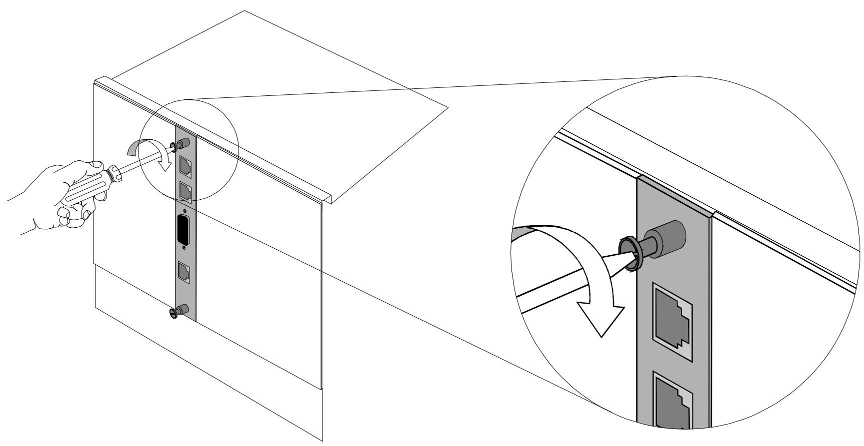
5 Slide the NIC into the chassis, until the front of the NIC is flush with the chassis.

Figure 85 Securing the NIC



6 Use a flat-head screwdriver to tighten the screws on the front panel.

Figure 86 Tightening the Front Panel



7 Cover any unused chassis slots with safety panels.

NAC Installation

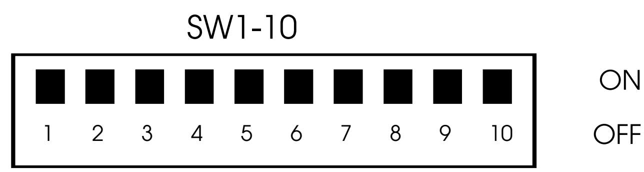
This procedure is used to install the NAC when there is not any traffic on the card.

Before you install the NAC, you may want to verify that the DIP switches are set to meet your environment needs.

DIP Switch Configuration

The access router card uses a ten-position DIP switch, as shown in the following figure.

Figure 87 DIP Switches

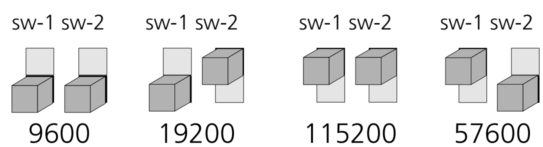


The factory default for all access router card DIP switches is the OFF position.

DIP Switches 1 and 2

Access router card DIP switches SW-1 and SW-2 control console port baud rate speeds as shown in the following figure. Set these DIP switches according to your console baud rate speed.

Figure 88 SW-1 and SW-2 Console Port Baud Rate Settings



DIP Switch 3

When turned to the **ON** position, DIP switch SW-3 enables an engineering fast boot. The access router card always skips checking for the Software Download 2 (SDL-2) download trigger and Configuration Menu. The default position of this switch is **OFF**.

DIP Switch 4

If you suspect that the Routing Software is faulty, turn DIP switch SW-4 to the **ON** position to disable Automatic Loading of the Pilgrim Routing Core. The default position of this switch is **OFF**.

DIP Switch 5

DIP switch SW-5 is not supported by the access router card’s software.

DIP Switch 6

DIP switch SW-6 is for CommWorks use only. When turned to the **ON** position, DIP switch SW-6 forces the boot code to only accept a new download of boot code. This does not allow the routing application to initiate its start up procedure. This is used when the updatable boot code has been corrupted and needs to be updated. The default position of this switch is **OFF**.

DIP Switch 7

When turned to the **ON** position, DIP switch SW-7 enables memory parity checking. When turned to the **OFF** position, DIP switch SW-7 disables memory parity checking. The default position of this switch is **OFF**.

DIP Switch 8

When turned to the **ON** position, DIP switch SW-8 disables all cache on the access router card. When turned to the **OFF** position, DIP switch SW-8 enables all cache on the access router card. The default position of this switch is **OFF**.

DIP Switch 9

DIP switch SW-9 is for CommWorks use only. When turned to the **ON** position, DIP switch SW-9 enables the Watchdog Timer. This is only useful on boards where resistor R69 has been depopulated. The default position of this switch is **OFF**.

DIP Switch 10

DIP Switch SW-10 is for CommWorks use only. When turned to the ON position, DIP switch SW-10 enables Full Manufacturing Mode Diagnostics. This causes Manufacturing Diagnostics to run instead of the application image. The default position of this switch is **OFF**.

Using the CLI, issue the **show board settings** CLI command to view current DIP switch settings and a description of their function. Consult the DIP Switch Settings section of the command's output in Table 16.

Table 16 Dip Switch Settings

1	2	3	4	5	6	7	8	9	10
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

SW 1-2	CLI baud rate:	115200
SW 3	Engineering Fastboot:	DISABLED
SW 4	Autoload application:	ENABLED
SW 5	CLI Require Carrier:	ENABLED
SW 6	L1 Data Cache:	ENABLED
SW 7	L1 Instruction Cache:	ENABLED
SW 8	L2 Cache	ENABLED
SW 9	Eng. Watchdog Disable:	DISABLED
SW 10	Manufacturing Test:	DISABLED

Consult the Technical Specifications appendix for more detailed information relating to the access router card.

To install the access router card NAC:

ESD: To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the NAC.

Install the NAC with or without power applied to the chassis.

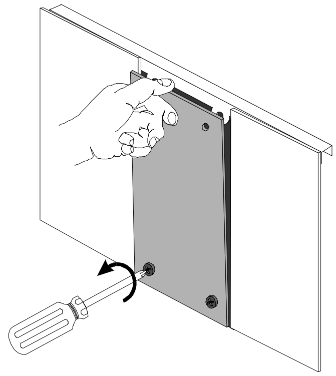
1 Confirm that the NIC corresponding to this NAC is installed. The NAC must be installed in the corresponding front slot.

2 Configure the NAC through the DIP switches. Refer to the Installing the Network Management Card Set chapter for DIP Switch information.

For a managed chassis, slot 17 is reserved for the network management card NAC.

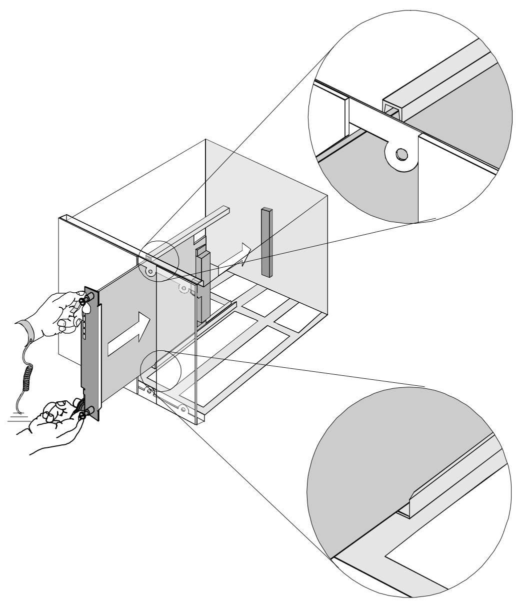
3 Use a #2 Phillips screwdriver to remove the safety panel covering the front of the slot where the corresponding NIC was installed in the back of the same numbered slot.

Figure 89 Removing the Safety Panel



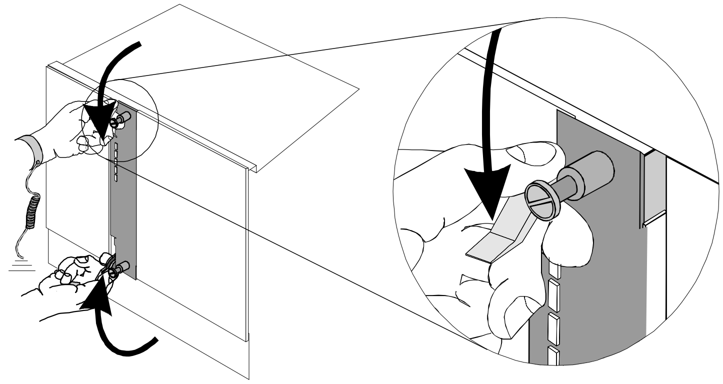
4 Insert the NAC between the slot's upper and lower card guides.

Figure 90 Inserting the Network Application Card



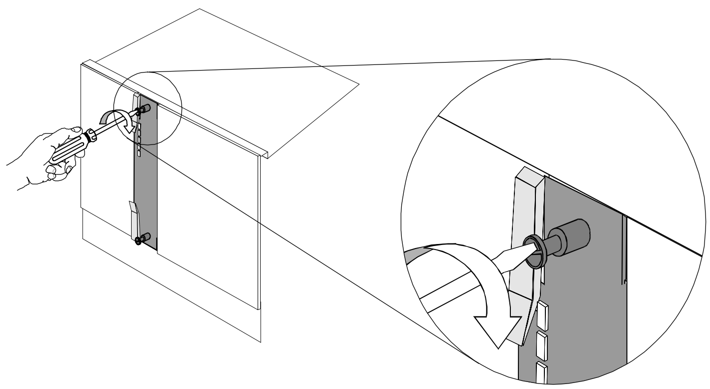
5 Holding the tabs perpendicular to the NAC's front panel, slide the NAC into the chassis, until the front of the NAC is flush with the chassis. Push the tabs toward each other to secure the NAC.

Figure 91 Securing the Network Application Card



6 Use a slotted screwdriver to tighten the screws on the front panel.

Figure 92 Tightening the Front Panel Screws



7 Cover any unused chassis slots with safety panels.

8 Apply power to the chassis, if power is not already applied.

Cabling

To access the CLI of the NAC, you need to connect cables to the corresponding NIC's console port.

Physical Interfaces

The PCI Dual 10/100 Base-T Ethernet NIC has the following physical interfaces:

Figure 93 PCI Dual 10/100 Base-T Ethernet NIC

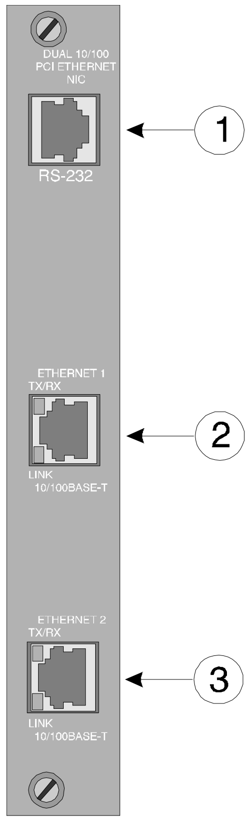


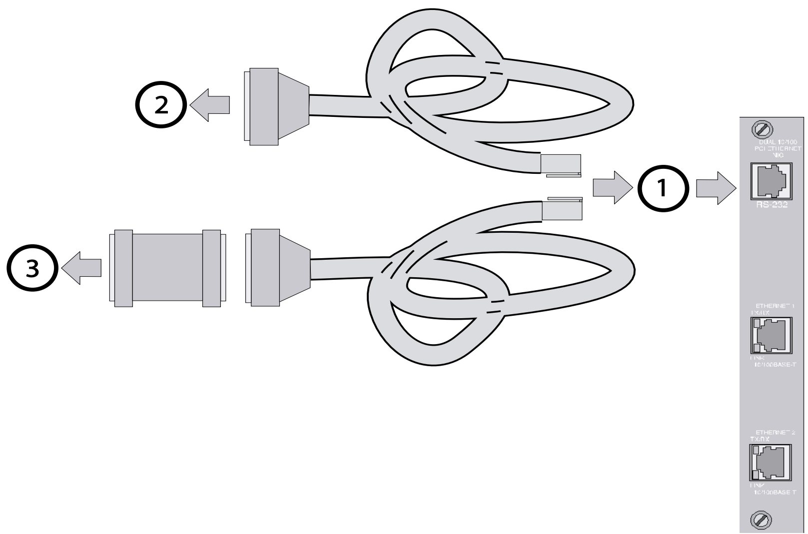
Table 17 references Figure 93.

Table 17 PCI Dual 10/100 Base-T Ethernet NIC Interfaces

Callout	Interface Description
1	RS-232: RJ-45 DTE port. Connect to this port to access the corresponding NAC’s UI. This port’s speed is determined by DIP switch settings on the NAC.
2	Ethernet 1: RJ-45 10/100 Base-T Ethernet port. Features TX/RX and link LEDs. Refer to the Trouble Locating and Clearing section for LED details.
3	Ethernet 2: RJ-45 10/100 Base-T Ethernet port. Features TX/RX and link LEDs. Refer to the Trouble Locating and Clearing section for LED details.

You must attach the cables as shown in the following diagram.

Figure 94 Network Cabling



[Table 18](#) references [Figure 94](#).

Table 18 Callout Number Descriptions

Callout Number	Description
1	RJ-45 connector to NIC's console port
2	RS-232 male connector to modem for remote operations
3	RS-232 female-to-female null modem adapter to PC or terminal COM port

Installation Verification

Verify installation by observing the LEDs after installing and powering the NAC and corresponding NIC. Refer to the Access Router Card Overview chapter for LED information.

Network Application Card Verification

To verify the installation of the access router card NAC:

- The RN/FL LED should be solid green.
- If the RN/FL LED does not light, or is solid red or flashing red, there is an error. Refer to the *Trouble Locating and Clearing* appendix for more information.

Network Interface Card Verification

Once the NAC is installed, the LEDs (if available) on the corresponding NIC should show activity. If it does not, Refer to the Trouble Locating and Clearing appendix for more information.

9 INITIAL CONFIGURATION—ACCESS ROUTER CARD

This chapter describes the startup procedure for configuring new access router cards onto your CommWorks Total Control® 1000 chassis. The startup procedure includes the following steps:

- Overview
- Accessing the Command Line Interface
- Configuration Options
- Configuring Using Quick Setup
- Setting Up the System Manually
- Configuring a Manage User (Network configuration)
- Configuring WAN Interfaces (Network configuration)
- Configuring Static Routes (Network configuration)
- Configuring Two Access Router Cards (Network configuration)
- Configuring System Security
- Saving the Configurations

After you have completed the procedures outlined here, you may want to further customize your system by modifying the configuration tables. Refer to Appendix C, Configuration Tables.

For assistance in troubleshooting the PSU or the PSI card refer to Appendix A, Trouble Locating and Clearing.

For the technical specifications for this card, refer to Appendix B, Technical Specifications.

For information on configuring the access router card for SS7, refer to Initial Configuration—Access Router Card for SS7 Signaling chapter.

Overview

The access router card is a multi-protocol, dial-up router and terminal server commonly described as a remote access server. It is a software-based router for incoming call traffic terminated on DSP multispan Network Application Cards (NACs). Access router cards receive incoming traffic from DSP multispan cards, encrypt the information and forward this traffic on to various egress ports.

This chapter gives an overview of configuring the access router card using the Command Line Interface (CLI). The CLI operates through a compatible software program (usually DOS based), and allows you to access internal databases which contain configuration information.

You can manage the access router card using the CLI over a Telnet connection or a direct serial line (RS-232) connection.

You can also manage the access router card and related components using Simple Network Management Protocol (SNMP) with the common element manager graphical interface. For a complete description of configuring the access router card, refer to the *Total Control 1000 Enhanced Data System Operations Guide*.

Accessing the Command Line Interface

This section contains procedures for physically connecting the access router card to a local workstation running terminal emulation software to access the command line interface menu. For information on configuring the access router card remotely, refer to the *Access Router Card 5.5 Command Line Interface Reference*.

The procedures have two parts:

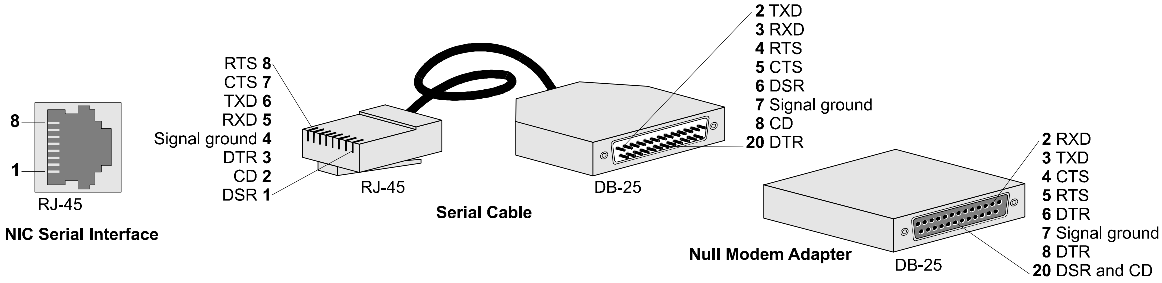
- Cabling
- Accessing the terminal emulation software

Cabling

You must first attach the access router card to your local workstation.

1. Connect the DB-25 (male) end of the cable shown in Figure 95 to the null modem adapter (female) that was supplied in the original packaging.
2. Connect the RJ-45 end of the cable shown in Figure 95 to the console port on the access router card Network Interface Card (NIC). The NIC is located in the rear of the Total Control 1000 chassis. The console port is the topmost port on the NIC.

Figure 95 Serial Connection Pinouts



3 Connect the null modem adapter directly to a serial port on the computer, or to an EIA-232 cable connected to a serial port on the computer.

Accessing the Terminal Emulation Software

After you have the cables connected, the next step is to run a terminal emulation software package. A familiar one is HyperTerminal.

1 Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.

2 Configure the communications application to use the COM port the serial cable is connected to.

Use Table 19 to configure the settings.

Table 19 Console Port Serial Communication Settings

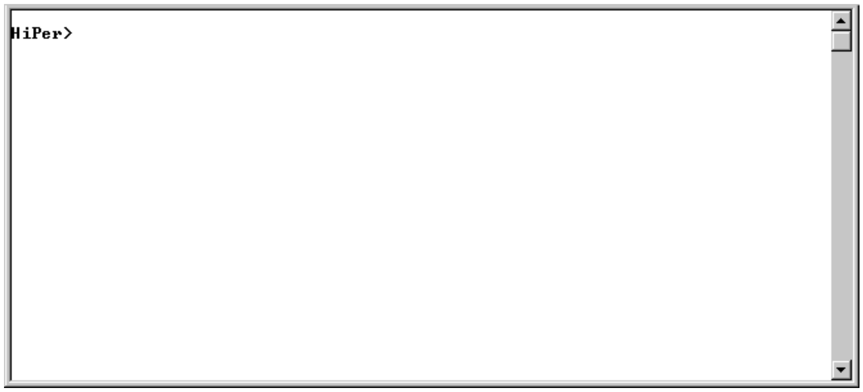
Setting	Variable
Port speed	115,200 bps (or whatever you initially configured DIP switch 1 and 2)
Terminal type	VT100
Data bits	8
Parity	None
Stop bits	1
Flow control	None

Refer to Network Management Card Overview for information on DIP switches.

3 At the terminal screen, Type in your login and password.

After you log in, the access router card's command line interface **root command prompt** displays.

Figure 96 Access Router Card CLI Login



Configuration Options

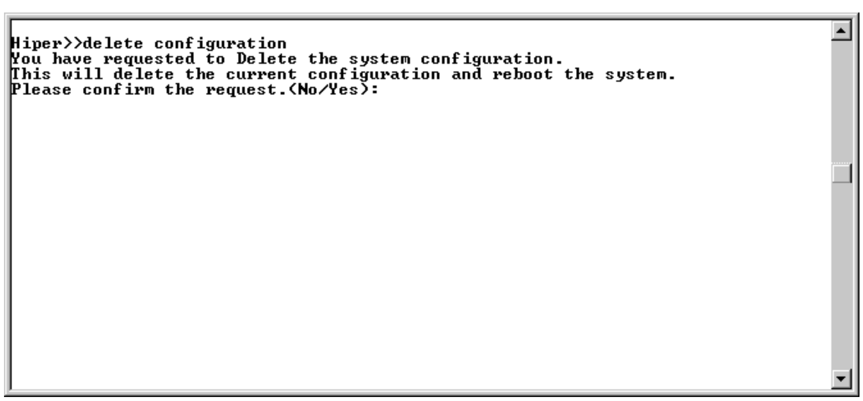
There are two basic configuration options open to you. You can either use the quick setup or manual set up. We recommend the quick setup.

Quick Setup

The access router card's automated quick setup program provides user-friendly configuration using the CLI. It performs simple setup of your entire system or selected functions. Just answer the mostly yes or no queries and the program does the rest. It is accessed automatically when the hardware is installed and the chassis is turned on. If you prefer, you have the option to start configuration in quick setup and continue in Command Line Interface (CLI).

*Press **TAB** when you are finished configuring the access router card through the CLI. The quick setup program is designed for initial setup only. When setup is done, this one-time program alters your configuration files, which quick setup cannot edit. So, if you make an error and need to restart, issue the **delete configuration** command to reboot and return to factory defaults.*

Figure 97 Delete Configuration Command



Manual Configuration

Manual configuration is meant for those who want to bypass all installation help programs and set up their access router card with minimal configuration.

Configuring Using Quick Setup

When your hardware is set up, you are ready to begin software configuration.

When you use the CLI to configure your access router card, we recommend the quick setup program to get your unit up and running fast. This CLI program incorporates a Wizard to help you go step by step through the process. A script of the quick setup follows - go through it and use it to jot down information you'll need to know.

If you do not want to use quick setup, refer to Setting Up the System Manually.

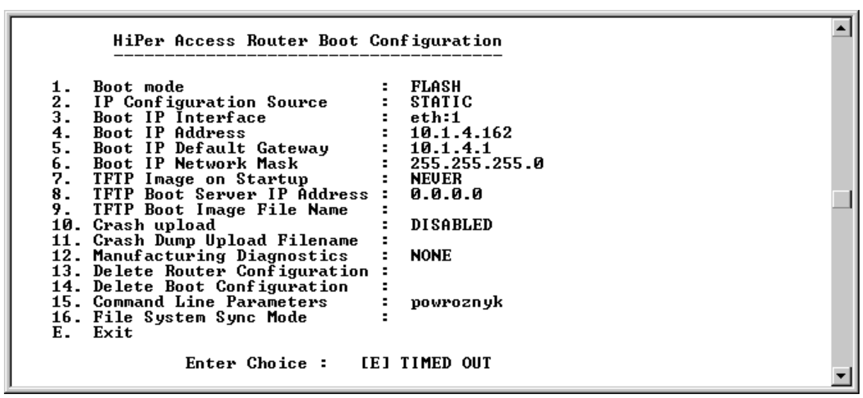
1 Power on the Total Control 1000 chassis.

In a few moments, after your screen has registered system initialization, it loads the boot prom and displays the following message:

```
BOOT PROM Version 0.03.02 (Built on May 2 2000 at
12:24:24)
```

For the following few seconds, new code can be downloaded but that is unnecessary at this point in first-time configuration. After access router card loads the kernel and enables several processes, the Boot Configuration menu appears.

Figure 98 Access Router Card Boot Configuration Menu

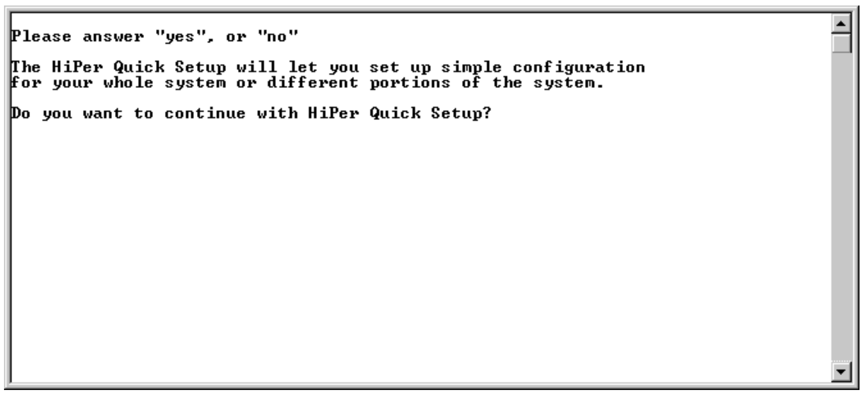


These items allow you configure parameters for system booting on normal power up, after a system crash, or to simply test the system. You do not need change any of these configurations for initial setup.

2 To proceed, you can type **Esc** and press **ENTER** or simply wait until the menu times out and the access router card prompt appears with the following screen - the actual quick setup script.

*When quick setup displays a question it displays a default answer in square brackets, like "[yes]". If you simply press **ENTER**, this is the answer that is used for you. Underlined spaces have been added to the script to allow its use as a worksheet. Text in parentheses and italicized indicates a text annotation. If you are reading this section before actually configuring the access router card, we recommend jotting down configuration information here before actually running the program to facilitate setup. Bracketed text [xxx] indicates the default value.*

Figure 99 Access Router Card Quick Setup Initial Menu



3 The quick setup lets you set up a simple configuration for your whole system or different portions of the system.

```
Do you want to continue with HiPer Quick Setup?____
```

4 There are two ways to proceed: You can set up only the basic configuration, which allows you to continue using the GUI application. Or you can configure a simple configuration for IP and IPX.

```
Do you want to configure only enough to use the GUI
based system [yes]? ____
```

*If you press **yes** to the previous question, the script continues with Quick Setup Identification information. If you press **no**, the script continues with the next question below.*

5 Please answer the following questions with "yes" or "no" to indicate which portions of the system you want to configure.

```
Network management [yes]? ____
IP [yes]? ____
IPX [yes]? ____
```

Figure 100 Access Router Card Identification Information

```
Quick Setup Identification information
--------------------------------------
>>> Enter the name of your system []:
>>> Who is the system contact person []?
>>> Where is this system located []?
```

6 When you complete the information on Figure 100, the Quick Setup Management Information screen appears.

Figure 101 Access Router Card Quick Setup Management Information Screen

```
Quick Setup Management information
----------------------------------

The GUI-based management system uses SNMP to communicate with the HiPer.

An SNMP community names a group of systems that can manage
your system via SNMP. It is a rudimentary form of security.
>>> What SNMP community will manage this system [public]?
>>> What is the address of the management station [0.0.0.0]?
>>> Do you want to allow command line management via TELNET [yes]?

For TELNET management of the system you need to create a user name
and password to control access.
>>> What user name will be allowed to manage this system [administrator]?
>>> What password will be used for this user []?
The password must be specified.
>>> What password will be used for this user []? administrator
```

IP Information

If you specified that you want IP configuration for the LAN Figure 102 appears.

Figure 102 Access Router Card Quick Setup IP Information Screen

```
Quick Setup IP information
--------------------------

IP configuration for LAN interface eth:1

The HiPer uses a network name to identify the network for
future management commands.
>>> Enter the network name of your IP network [ip]:

>>> Enter the IP address for the HiPer []: 149.112.250.119

The IP mask can be specified as a class ("A", "B", or "C"),
the number of one bits in the mask, or as an address in the format
255.x.x.x
>>> What should the mask be set to [B]?

>>>Do you want to set up a default gateway [yes]?

The default gateway gives the address of a router that the HiPer
will forward packets to when it has no other route to their destination.
It cannot be the same address as the IP address for the HiPer
>>> Enter the IP address of the default gateway []? 149.112.250.118

The metric or "hop count" tells the HiPer how far the default
router is from the HiPer.
>>> What metric should be applied to the default gateway [1]?

It is possible to restrict access to the TFTP server to a specific
system or a list of systems. Quick Setup will allow you to enter
one system that is allowed or allow all systems access
>>>Do you want to allow all systems to access the TFTP server [no]?
>>>From what IP address will you allow access to your TFTP network server []?
That does not parse to a valid ip address.
>>>From what IP address will you allow access to your TFTP network server []? 14
9.112.250.120
IP setup is completed.
```

IPX Information

If you specified that you want IPX configuration for the LAN the following information displays.

7 The network name is used by the access router card to identify your IPX network.

`>>> Enter the name of your network [ ]: ____`

8 The network number is a non-zero hexadecimal number of up to 8 digits.

`>>> Enter the IPX network number [ ]: ____`

9 You need to specify the framing for the IPX network.

It should be one of the following: "ethernet_ii", "snap", "dsap", "novell_8023."

```
>>> What is the framing for the IPX network
[ethernet_ii]? ____
```

10 You can either assign each user his or her own address or you can set aside a pool of addresses for dynamic allocation.

```
>>>Do you want to set up an address pool [yes]? ____
```

*If you press **yes** to the previous question, the script continues below. If you press **no**, the script continues with: “Would you like to review...”*

11 The address pool is a continuous range of addresses.

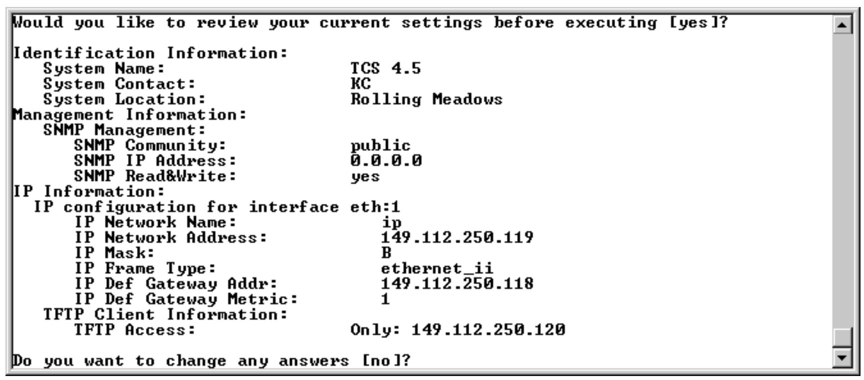
```
>>>What is the initial address in the pool [ ]? ____

>>>How many addresses should be in the pool [ ]? ____

Would you like to review your current settings before
executing [yes]? ____
```

*If you press **yes** to the previous question, the script continues below. If you press **no**, the script continues with: “Do you want to change any answers?*

Figure 103 Access Router Card Quick Setup Review Screen



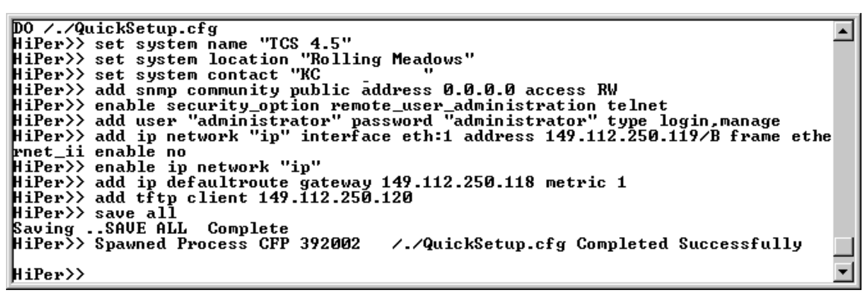
```
Would you like to review your current settings before executing [yes]?

Identification Information:
   System Name:                    TCS 4.5
   System Contact:                 KC
   System Location:                Rolling Meadows
Management Information:
   SNMP Management:
      SNMP Community:              public
      SNMP IP Address:             0.0.0.0
      SNMP Read&Write:             yes
IP Information:
  IP configuration for interface eth:1
      IP Network Name:                ip
      IP Network Address:             149.112.250.119
      IP Mask:                        B
      IP Frame Type:                  ethernet_ii
      IP Def Gateway Addr:            149.112.250.118
      IP Def Gateway Metric:          1
   TFTP Client Information:
      TFTP Access:                 Only: 149.112.250.120

Do you want to change any answers [no]?
```

*If you press **no** to the previous question, the script continues below. If you elect to change an answer by entering **yes**, quick setup prompts you section by section for new entries and asks you once again to review current sessions before executing.*

Figure 104 Access Router Card Quick Setup Review Results Screen



```
DO /./QuickSetup.cfg
HiPer>> set system name "TCS 4.5"
HiPer>> set system location "Rolling Meadows"
HiPer>> set system contact "KC         "
HiPer>> add snmp community public address 0.0.0.0 access RW
HiPer>> enable security_option remote_user_administration telnet
HiPer>> add user "administrator" password "administrator" type login,manage
HiPer>> add ip network "ip" interface eth:1 address 149.112.250.119/B frame ethe
rnet_ii enable no
HiPer>> enable ip network "ip"
HiPer>> add ip defaultroute gateway 149.112.250.118 metric 1
HiPer>> add tftp client 149.112.250.120
HiPer>> save all
Saving ..SAVE ALL  Complete
HiPer>> Spawned Process CFP 392002   /./QuickSetup.cfg Completed Successfully

HiPer>>
```

Setting Up the System Manually

This section describes how to manually set up your access router card with minimal configuration.

Power On

To begin manual configuration:

1. Power on the unit. After a few moments, when your screen has registered system initialization, loaded the kernel and enabled a number of processes, the Boot Configuration menu appears. After a few seconds, the CLI times out and default to the **Hiper>>** prompt
2. The **Hiper>>** prompt appears. If prompted by quick setup to continue, type: **no**.

System Basic Setup

Follow these steps:

1. Name your access router card and specify additional system information. The name you enter serves as the access router card's DNS name and SNMP system name. It is also the name that the access router card advertises in Service Advertising Protocol (SAP) broadcasts.

   The name must be unique - no other device on your network can share it.

   You should also indicate the following information:

   - *location*—where the access router card actually resides
   - *contact*—the person to contact about access router card issues

   Use the following command:

   ```
   set system name <“Access Router Card name” (up to 64
   characters)>
   location <“system site”>
   contact <“contact information”>
   ```

   You can enter the command all at once or in separate commands. For example:

   ```
   set system name “total control” location "boston"
   contact “Keyser Sosay @ 508 123-4567 666x”
   ```

   Or type:

   ```
   set system name “total control”
   set system location "boston"
   set system contact "Keyser Sosay @ 508 123-4567 666x”
   ```

2. Verify the previous configuration by typing:

   ```
   show system
   ```

To set the system Greenwich Mean Time (GMT) date and time type the following commands:

```
set date <dd-mmm-yyyy> time <hh:mm:ss>
```

Verify the previous configuration by typing:

```
show date
show time
```

3 Save your work by typing:

```
save all
```

4 Press **ENTER**.

IP Configuration

This section describes how to manually configure the Enhanced Data Systems (EDS) LAN interface (eth:1/eth:2) for IP networks.

1 Enter IP network information. The network address consists of the station address and a subnet mask using this format:

```
nnn.nnn.nnn.nnn/A, B, C, H, 8-30 or nnn.nnn.nnn.nnn
```

The first four octets describe the IP station address, followed by the subnet mask (contiguous) designator. You can specify the subnet by class, numerical designation or in the IP address format. If you specify a Class C mask, for example, this command generates a default 255.255.255.0 subnet value for you. If you specify the number of 1 bits in the mask, the acceptable range is 8-30 (32 if a host).

The network address is considered invalid if the portion of the station address not covered by the mask is 0, or if the station address plus the mask is -1 (all 1's). Defining a numerical subnet is useful when it falls between classes.

Enter IP network information. Type:

```
add ip network <network name>
address <station address/mask>
interface [eth:1 or eth:2]
frame [ethernet_ii or snap]
```

For example:

```
add ip network backbone address 192.75.202.99/C
interface eth:1
frame ethernet_ii
```

A numerical mask example:

```
add ip network backbone address 192.75.202.99/24
interface eth:1
frame ethernet_ii
```

2 Verify the previous configuration by typing:

```
show ip network <network name>
```

Check the connection by using the ***ping*** *<ip address> command. See the* Access Router Card Command Line Reference *for more information.*

3 Configure an IP address pool of contiguous network addresses for allocation to dial-in hosts. This command limits RIP traffic by aggregating users within a single advertised address. Set an initial_pool_address, overall size of the pool, and public or private pool membership. Use this command:

```
add ip pool <pool_name>
initial_pool_address <IP_address/subnet mask>
route [aggregate or no_aggregate]
size <1-4096>
state [public or private]
```

For example:

```
add ip pool homelan initial_pool_address 192.75.202.99/c
route aggregate size 150 state private
```

4 Verify the previous configuration by typing:

```
list ip pools
```

5 Set a default gateway. Default gateways must be on the same subnet as a configured interface.

You also need to supply a metric (hop count) for each type of default gateway. Possible values range from 1 (default) to 15. Note that since the actual metric of a default gateway is only 1 hop, the value entered here is used to control the perceived cost of the gateway to other routers on your network.

For example, a high metric will limit the number of hops that the route is broadcast and may cause other routers to see it as a less preferable route.

To add the default gateway, use the following command:

```
add ip defaultroute gateway <default route gateway ip
address>
metric <integer>
```

For example:

```
add ip defaultroute gateway 192.75.202.40 metric 1
```

6 Verify the previous configuration by typing:

```
list ip defaultroute
```

7 Save your work by typing:

```
save all
```

8 Press **ENTER**.

IPX Configuration

To configure the access router card’s LAN interface on an IPX network, you must:

- Determine the IPX network number
- Set the access router card’s IPX parameters

Important: Even if your network uses only IPX, you must still set up an IP address for the access router card if you want to use our network management card or common element manager application later.

Determining the IPX Network Number

If your network uses the Internetwork Packet Exchange (IPX) protocol, you must first enter the IPX network number of the segment connected to the access router card's LAN port. You can find this network number using the Novell CONFIG utility.

For File Servers Running Novell Version 3.xx:

1 Go to a console of a file server on the same network segment as the access router card.

2 From the Novell Console program press **Ctrl Esc**, then **Esc**, until the**:** (colon) prompt appears. Select **System Console** and press **ENTER**.

3 Type the following:

```
config
```

4 Press **ENTER**.

A display similar to the one shown below appears:

```
File server name:  USR_SERVER_ONE

IPX internal network number: 0000000A

Western Digital Star EtherCard PLUS Driver v2.05
(910424)

Hardware setting: I/O Port 300h to 31Fh, Memory CC000h
to Cffffh, Interrupt Ah

Node address: 0000C0488D28

   Frame type: ETHERNET_802.3

   Board name: TENBASE_802.3

   LAN protocol:  IPX network 00000255

Western Digital Star EtherCard PLUS Driver v2.05
(910424)

Hardware setting: I/O Port 300h to 31Fh, Memory CC000h
to Cffffh, Interrupt Ah

   Node address: 0000C0488D28

   Frame type: ETHERNET_802.2

   Board name: TENBASE_802.2

   LAN protocol: RPL

   LAN protocol: IPX network 00000684
```

This is an example of the information returned for one version 3.xx card that has two different frame types. The card has one port address, but two LAN protocol network addresses, one for each frame type. The network number for 802.3 is 00000255, and for 802.2 it is 00000684.

5 Write down the LAN protocol IPX network number for the frame type you require.

For File Servers Running Novell Version 2.xx:

1 Go to the console of a file server on the same network segment as the access router card.

2 Press **Ctrl Esc** until the **:** (colon) prompt appears and type the following:

```
config
```

3 Press **ENTER**.

A display similar to the one shown below appears:

```
LAN A Configuration Information:

Network Address:  [0788] [002608C0D53F4z]

Hardware Type:   [3Com 3C505 EtherLink Plus (Assy
2012 only) V2.30EC (880813)]

Hardware Setting:  IRQ=5, IO=300h, DMA 5
```

The example above has only one frame type, so the network address is 0788.

4 Write down the network address for the frame type you require.

Setting IPX Parameters

To configure the access router card's LAN interface for an IPX network:

1 Specify IPX network information including the network name, address, interface and frame type of the network segment connected to the access router card's LAN port. Note that the same physical network segment have a different network number for each frame type used. Be sure to enter the network number associated with the chosen frame type. Use the following command:

```
add ipx network <network name>
address <ipx address>
interface [eth:1 or eth:2]
frame [ethernet_ii or snap or dsap or novell_8023]
```

For example:

```
add ipx network segment2 address 00000576 interface
eth:1 frame ethernet_ ii
```

*Omit preceding zeros: the access router card accepts "**576**" as the correct network number.*

2 Verify the previous configuration by typing:

```
show ipx network <network name>
```

3 Set the IPX default gateway with the format *xxxxxxxx.xx:xx:xx:xx:xx:xx* where *xxxxxxxx* is the IPX network address and *xx:xx:xx:xx:xx:xx* is a Management Address Card (MAC) address.

```
set ipx system default_gateway <network number.mac
address>
```

For example:

```
set ipx system default_ gateway 011:11:11:01:11:00:11
```

4 Verify the previous configuration by typing:

```
list ipx routes
```

5 Save your work by typing:

```
save all
```

6 Press **ENTER**.

DNS Configuration

This section sets a Domain Name Server (DNS). If you do not wish to use DNS, skip to SNMP Configuration.

1 Specify the IP address of the server you want to function as the DNS server, which translates host names into their corresponding IP addresses - when queried - and saves that information in a local Hosts Table.

Also, name up to 10 DNS servers using the command below and specify the order (preference) you prefer they be chosen (highest priority = 1).

The access router card tries to reach each configured host three times in round-robin fashion before issuing an error message. For instance, in the case of three off-line servers - A, B and C - the access router card admits failure only after trying to reach them one after the other, three times.

Use the following command:

```
add dns server <ip_address> preference <number> name
<server_name>
```

For example:

```
add dns server 192.75.222.182 preference 1 name farley
```

The DNS server is only consulted to resolve host names not found in the Hosts Table. If you are using a name service, the Hosts Table may be left empty. Use the ***resolve name*** or ***host*** *command to learn DNS host names or numbers.*

2 Verify the previous configuration by typing:

```
list dns servers
```

3 Specify the default domain - the Ethernet segment where your system resides and where you are defaulted should you forget to name the DNS server. Adding this entry to the Hosts Table avoids having to always specify the domain.

Type:

```
set dns domain_name <string>
```

For example:

```
set dns domain_name usr.com
```

4 Verify the previous configuration by typing:

```
show dns
```

5 Save your work by typing:

```
save all
```

6 Press **ENTER**.

SNMP Configuration

The following section configures SNMP service. If you do not wish to set up SNMP, skip to Configuring a Manage User.

If you plan to use an SNMP application to configure and manage the access router card, you must specify SNMP community values. SNMP community names segregate administrative management groups and should match the community settings of your generic SNMP software. You must set the following:

- name—community name
- address—IP address of the SNMP manager
- access—either read-only, read-write or administrator (read and write) access

For a public community with read-only privileges, assign the address to any station (0.0.0.0.). Read/write and administrator privileges are also available.

1 Add the SNMP community values.

Type:

```
add snmp community <name>
address <IP address>
access [ro or rw or adm]
```

For example:

```
add snmp community mis address 192.77.202.30 access adm
```

Abbreviate command keywords provided they are unique to the command.

2 Verify the previous configuration by typing:

```
list snmp communities
```

3 Save your work by typing:

```
save all
```

Press **ENTER**.

Configuring a Manage User

This section describes how to create an administrative user with manage privileges to configure the access router card at the CLI through a direct login to the system through the Console port or eventually through a telnet session. You can add a remote login user, or, if you prefer to dial in, add a manage user locally through the Console port now, but you can not do so through telnet at this point in setup.

Important: Only manage users can access the CLI.

1 Create a manage user. You have these options:

- If you want the manage user to login, use the command below, set the type to manage,login and login service (telnet is the default; otherwise choose Rlogin or ClearTCP).
- If you want a manage user to access the device through a dial-in (network) connection, use the command below. The network service default is PPP; otherwise select SLIP.

```
add user <user_name>
network_service <FR_1490 PPP SLIP>
type [login,network,callback,dial_out,manage]
password <password>
```

Passwords are optional. You may add a null password with the keyword password and string: “”

Network example with a password:

```
add user predator type manage,network password arnold
```

Login example without a password:

add user predator type manage,login password “ “

Verify the previous configuration by typing:

```
show user predator
```

2 Save your work. Type:

```
save all
```

3 Press **Enter**.

Configuring WAN Interfaces

The access router card automatically detects any installed WAN devices (T1/E1 and V35) when the system is powered on. You must logically partition T1/E1 WAN interfaces into logical interfaces before you can run a datalink protocol such as PPP or Frame Relay over them. V35 WAN interfaces do not require any partitioning. However, you can configure physical interface parameters for all WAN interfaces such as speed and flow type (V35 interfaces) and line type and coding (T1/E1 interfaces).

Configuring Physical Interface Parameters

To configure physical interface parameters for a V35 interface, use this command:

```
set sync interface <physical_if_name>
```

For detailed information about this command and parameters refer to the *Access Router Card Command Line Reference* manual.

To configure physical interface parameters for a T1/E1 interface, use this command:

```
set ds1 interface <physical_if_name>
```

For detailed information about this command and parameters refer to *Access Router Card Command Line Reference* manual.

Partitioning a T1/E1 WAN Interface

T1/E1 WAN physical Interfaces can be partitioned. V35 interfaces, among others, can not be partitioned, although data transfer can occur over these physical interfaces that cannot be partitioned. Thus Datalink layers can be added over these interfaces.

There is a need to create logical interfaces for transferring data over physical interfaces that can be partitioned. Datalink Layers then need to be added over these logical interfaces. The following commands need to be issued for creating Logical Interfaces for T1/E1 spans:

```
add logical_ds1 interface <interface_name>
```

This command adds a logical interface. However no DS0's are assigned to this interface. Thus this interface does not have any bandwidth or some part of the physical interface assigned to it.

```
set logical_ds1 interface <interface_name> ch_map <1-24>
```

This command assigns some bandwidth for data transfer.

Manually Configuring the WAN Interface

Protocols are set up over the WAN by creating and editing a user profile. A user profile specifies the call type, protocols, addresses, and bandwidth management parameters that determine how you connect and communicate to that user (remote site) over the WAN.

When you save user profiles you've just created, you are finished configuring the access router card side of the link. Configuration of the router on the remote side of the link varies with your product, but setup includes the local IP address. See your product manual for more information.

Configuring PPP on a WAN Interface

Configuring PPP over a WAN interface is performed in two steps:

- Create an appropriate user profile.
- Add PPP datalink over the WAN interface and specify the user profile.

The following is an example of configuring PPP over a WAN interface.

Creating User Profile

```
add user test password test type network,dialout

set network user test network_service ppp

set network user test ipx usage disable

/*just as an example, disabled ipx */

set network user test ip usage enable routing both
routing_protocol

ripv1

set network user test remote_ip_address 1.1.1.2

set dialout user test local_ip_address 1.1.1.1
```

Adding Datalink Over WAN Interface

```
add datalink ppp user test interface "if_name" enabled
yes
```

The value for **if_name** *is a physical interface name for a V.35 interface and a logical interface name for a T1/E1 interface.*

Refer to the *Access Router Card Command Reference* manual for more detailed information on CLI commands and command parameters.

Configuring Static Routes

The access router card provides the ability to dynamically learn remote IP routes through the IP RIP protocol. The access router card also offers the option of configuring a static route when you know the destination you want to connect with. The **add ip route** or **add ipx route** commands set the destination's IP/IPX address, the gateway used to access the remote destination, and a metric value or distance in hops to reach the destination from the access router card.

IP Routes

The command below adds an IP static route entry to the IP Routing Table:

```
add ip route <ip_network_address>
gateway <gateway_address>
metric <hop_count>
```

The IP address of the remote destination is written in the format *nnn.nnn.nnn.nnn,* entered with or without a mask specifier. The mask specifier can be designated either 'A', 'B', 'C', or 'H' (host), or with a numeric value from 8 to 30 (32 if a host) that describes the number of one bits in the mask. You can also specify the netmask in the *xxx.xxx.xxx.xxx* format. If you do not specify a mask, the system generates it (based on the network address) for all routes (ip_net_addresses) except host routes, for which you must specify a mask.

For example:

```
add ip route 145.122.231.43/h gateway 145.122.232.28
metric 1
```

The **list ip routes** command displays all currently defined routes including the route just configured but only if you have specified a gateway.

*Static routes are installed but not visible through the **list ip routes** command until the interface to the gateway is active (entered in the IP/IPX Forwarding Tables).*

IPX Routes

The command below adds an IPX static route entry to the IPX Routing Table:

```
add ipx route <ipx_network_address>
gateway <gateway_address>
metric <hop_count>
ticks <number>
```

The *IPX network address* of the remote destination is written in the hexadecimal format *xxxxxxxx* where addresses ffffffff or fffffffe are invalid.

The *gateway* is expressed in the hex format *xxxxxxxx.xx:xx:xx:xx:xx:xx* where *xxxxxxxx* is the IPX network address and *xx:xx:xx:xx:xx:xx* is a MAC (Ethernet) address. *Metric* and *tick* values are also required. Ticks specify the interval between transmission and delivery of a packet to the remote network.

For example:

```
add ipx route fffff111 gateway
fffff101.ff:ff:ff:00:00:ff metric 1 ticks 1
```

The **list ipx routes** command displays all currently defined routes including the route just configured but only if you have specified a *gateway.*

Static routes are installed but not visible through the ***list ipx routes*** *command until the interface to the gateway is active (entered in the IP/IPX Forwarding Tables).*

Configuring Two Access Router Cards

Administrators concerned with enhancing the performance of their Total Control 1000 chassis may want to install two or more access router cards in their chassis. Using more than one access router card lowers latency rates by applying plenty of CPU processing power to calls received and relegates fewer calls per card. It also guarantees redundancy should one access router card fail, and, if the chassis is employed as a router, it ensures that performance is not degraded significantly as LAN traffic increases.

In order to properly configure more than one access router card on the chassis, statically configure your installed modem cards by setting their card type ownership or dynamically configure the cards using Dynamic Slot Assignment (DSA). A third method employs DSA rebalancing which periodically reassigns slot ownership by the network management card.

With one access router card installed, other NACs in the chassis are set dynamically by the device discovery ability (chassis awareness) of the network management card which automatically determines the card type. If your chassis has the network management card installed, we recommend you configure only the owner parameter for each access router card and allow the network management card to configure the system as necessary.

Slot Configuration Test Cases

To configure more than one access router card, use this command on each access router card:

```
set chassis slot <1-16>
card_type [empty or hdm_24 or hdm_30 or quad_i_modem or
quad_modem]
owner [no or yes]
ports <1-30>
```

If your chassis does not have an network management card installed, and you want to statically configure slots, you must specify all values configured by the **set chassis slot** command. If your chassis has the network management card installed, you need only specify slot and owner parameters for static configuration - the network management card does the rest.

Example 1

In the example below, if an network management card is installed, set the owner value for the modem cards on each access router card:

```
HiPer A:
set chassis slot 1,3,5,7,9,11,13,15 owner yes
set chassis slot 2,4,6,8,10,12,14,16 owner no

HiPer B:
set chassis slot 1,3,5,7,9,11,13,15 owner no
set chassis slot 2,4,6,8,10,12,14,16 owner yes
```

Issue the following command to verify your previous configuration:

```
list chassis
```

The first two commands above allow the network management card to configure owned chassis slots and prevents configuration of non-owned chassis slots. In other words, access router card A owns the odd slots and access router card B owns the even slots. Be careful not to configure conflicting owned/non-owned slot values.

Non-owned slots (owner no) are considered off-line by both access router cards and their modems non-functional by the network management card.

Example 2

In the next example, configure two access router cards with all ports statically set, without an network management card installed. Be sure to turn off chassis awareness. Type:

```
HiPer A:
set chassis slot 1-8 card_type hdm_30 owner yes ports 30
set chassis slot 9-16 card_type hdm_30 owner no ports 30
disable nmc chassis_awareness

HiPer B:

set chassis slot 9-16 card_type hdm_30 owner yes ports
30
set chassis slot 1-8 card_type hdm_30 owner no ports 30
disable nmc chassis_awareness
```

Issue the following command to verify your previous configuration:

```
list chassis
```

The first two commands above assign ownership of all 30 modems in each of the first eight DSP multispan cards to one access router card and all 30 modems on each of the next eight DSP multispan cards to the second access router card in the chassis. To support load balancing, we recommend you statically configure half of your modem ports per access router card installed. If you have a mix of different card types in the chassis, you should assign ownership so that the total number of ports are owned equally by the access router cards.

Example 3

In the example below, set the same configuration as above but with the network management card installed. Chassis awareness is enabled by default. Also, be sure that enough IP/IPX addresses are configured in the address pool (**add ip/ipx pool** command) to handle traffic for the entire chassis. Type:

```
HiPer A:
set chassis slot 1-8 owner yes
set chassis slot 9-16 owner no
enable nmc dynamic_slot_assignment

HiPer B:
set chassis slot 9-16 owner yes
set chassis slot 1-8 owner no
enable nmc dynamic_slot_assignment
```

The commands above illustrate how the network management card can recognize the card type and port numbers without you having to specify them.

Example 4

In the example below, to configure one access router card with half the slots configured statically and the other access router card with half the slots configured dynamically, type:

```
HiPer A:
set chassis slot 1-8 card_type hdm_24 owner yes ports 30

HiPer B:
set chassis slot 9-16 owner yes
```

Example 5

Another scenario involves installing one access router card to handle all modems statically and having the other access router card, a manual "warm spare," on hand in case the first access router card fails. This option avoids a single point of failure and extensive down time for a heavily used chassis. Load rebalancing should not be used when configuring a hot standby. Type:

```
HiPer A:
set chassis slot 1-14 card_type hdm_24 ports 24 owner
yes
```

```
HiPer B:
set chassis slot 1-14 card_type hdm_24 ports 24 owner no
```

If the access router card which currently owns the modem cards fails, type:

```
HiPer B:
set chassis slot 1-14 owner yes
```

Example 6

The following scenario sets the same configuration as above but turns on DSA and turns off Idle Rebalancing. Type:

```
HiPer A:
set chassis slot 1-14 card_type hdm_24 ports 24 owner
yes
disable nmc dsa_idle_rebalancing

HiPer B:
set chassis slot 1-14 card_type hdm_24 ports 24 owner no
enable nmc dynamic_slot_assignment
disable nmc dsa_idle_rebalancing
```

If the access router card which currently owns the modem cards fails, type:

```
HiPer A:
set chassis slot 1-14 card_type hdm_24 ports 24 owner
yes
```

or

```
HiPer B:
set chassis slot 1-14 owner yes
```

Example 7

You can configure the access router card to assign ownership to modem cards through the network management card.

For example, if there are 10 modem cards in the chassis, the network management card assigns 5 to access router card A and 5 to access router card B. Type:

```
HiPer A:

set chassis slot 1-16  owner no

enable nmc chassis_awareness

enable nmc dynamic_slot_assignment

enable nmc dsa_idle_rebalancing
```

or

`HiPer B:`

`set chassis slot 1-16  owner no`

`enable nmc chassis_awareness`

`enable nmc dynamic_slot_assignment`

`enable nmc dsa_idle_rebalancing`

It takes the network management card four minutes to complete this procedure. After 4 minutes use the **list chassis** command to confirm the ownership of the modem cards. The CLI should confirm the assigned ownership.

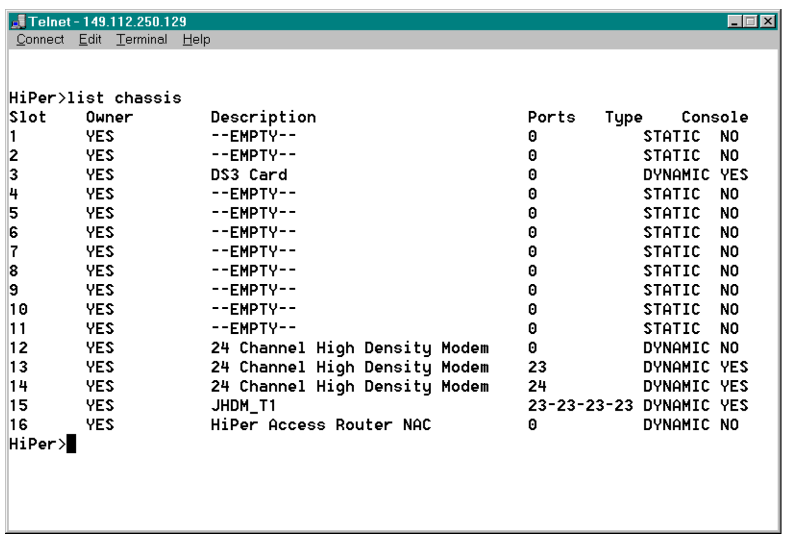
Viewing Chassis Parameters

Use the following command to verify your dynamic and static slot settings, as well as card types and port numbers on the chassis. Type:

`list chassis`

The following information displays.

Figure 105 List Chassis Command Results




```
HiPer>list chassis
Slot    Owner        Description                      Ports    Type    Console
1       YES          --EMPTY--                        0           STATIC  NO
2       YES          --EMPTY--                        0           STATIC  NO
3       YES          DS3 Card                         0           DYNAMIC YES
4       YES          --EMPTY--                        0           STATIC  NO
5       YES          --EMPTY--                        0           STATIC  NO
6       YES          --EMPTY--                        0           STATIC  NO
7       YES          --EMPTY--                        0           STATIC  NO
8       YES          --EMPTY--                        0           STATIC  NO
9       YES          --EMPTY--                        0           STATIC  NO
10      YES          --EMPTY--                        0           STATIC  NO
11      YES          --EMPTY--                        0           STATIC  NO
12      YES          24 Channel High Density Modem    0           DYNAMIC NO
13      YES          24 Channel High Density Modem    23          DYNAMIC YES
14      YES          24 Channel High Density Modem    24          DYNAMIC YES
15      YES          JHDM_T1                          23-23-23-23 DYNAMIC YES
16      YES          HiPer Access Router NAC          0           DYNAMIC NO
HiPer>
```

PPP Compression Options

By default, the access router card attempts PPP data compression for only digital and uncompressed analog call types. Use the following command to turn off all PPP compression for all call types:

`set ppp ccp_modemtype_accept none`

Or, to enable PPP compression only for analog calls with modem compression:

```
set ppp ccp_modemtype_accept compressed_analog
```

Viewing Compression Settings

Use the command below to verify the type of packet compression you want the access router card to perform. Type:

```
show ppp settings
```

A sample of possible results of a Show PPP settings command is shown in Figure 106.

Figure 106 Sample of the Show PPP Settings Command

```
HiPer>show ppp

PPP SETTINGS

PPP AUTHENTICATION
DIAL_IN Users Authenticate:                 ANY
PPP Authentication Preference:              DEFAULT
System Transmit Authentication Name:        HiPer

PPP offloading:                             ENABLED

CCP will be attempted for call type(s):     DIGITAL
                                            UNCOMPRESSED_ANALOG
System MTU :                                1514

Primary NBNS Server address:                0.0.0.0
Secondary NBNS Server address:              0.0.0.0

DNS configuration Usage:                    SYSTEM

Primary PPP DNS Server address:             0.0.0.0
Secondary PPP DNS  Server address:          0.0.0.0

PPP session start message:                  PPP session from %server_ip to %client
_ip beginning....

Send Accounting for PPP Abnormal Disc:      DISABLED

PPP Address Field Compression:              ENABLED
PPP Protocol Field Compression:             ENABLED
PPP Multilink PPP:                          ENABLED
PPP BACP and BAP:                           DISABLED
PPP Bap Hunt Group Phone Number:
PPP Receive ACCM:                           DISABLED
PPP Negotiated Callback:                    DISABLED
PPP Process RADIUS Challenge during PAP:    DISABLED
PAP Authentication Retries:                 3
PPP Send EDO status:                ENABLED
HiPer>
```

Configuring System Security

The access router card is configured with an administrative user named **adm** which has no password. This allows remote access through telnet. To ensure security on your system, use the CLI to either:

- Add a password to the **adm** user, or
- Add a new administrative user and then delete **adm**

Password Protecting

To password protect **adm**:

1 Type the following text, making sure to fill in the desired password:

```
set user adm password <password_text>
```

2 Press **ENTER**.

3 Type:

```
save all
```

4 Press **ENTER**.

Adding a New Administrative User and Deleting adm

The alternative to password protection is to add a new user and then delete **adm**. However, be sure to add the new administrative user first and then delete adm only after you save the newly added user.

To add a new administrative user and delete **adm**:

1 Type the following text, making sure to fill in the desired user name and password:

```
add user <user_name> password <password_text> type
login, manage
```

2 Press **ENTER**.

3 Type:

```
save all
```

4 Press **ENTER**.

5 Type:

```
delete user adm
```

6 Press **ENTER**.

7 Type:

```
save all
```

8 Press **ENTER**.

CAUTION: *In consideration of providing the password protection directions above, you are accepting the following disclaimer: CommWorks Corporation hereby disclaims and shall not be liable for damages of any kind, whether direct, indirect, special, consequential, or punitive, or for loss of revenue or profits, loss of business, loss of information or data, or other financial loss arising out of any event in which an unauthorized party accesses your system for any reason.*

Saving the Configurations

When you finish configuring the access router card you must save the configuration before it will take effect. You can do this using either the common element manager or the CLI. For more information on saving configurations, refer to the *Operations Guide*.

Common Element Manager

To save the new configurations using common element manager:

1 Click **Save all** on the Configuration tab window.

2 Right-click the access router card.

3 Select **Save to NVRAM** on the Configuration pop-up list.

4 Right-click the chassis.

5 Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

Command Line Interface

To save the new configurations using CLI:

1 Entering the following command.

`HiPer>>save all`

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

`>` **`reboot`**

10 Initial Configuration—Access Router Card for SS7 Signaling

This chapter describes how to configure the access router card for SS7 signalling.

This chapter contains the following topics:

- SS7 Description
- Accessing the Command Line Interface
- Configuring SS7 Signaling on the Access Router Card
- Saving the Configurations

For T1 applications we recommend that you use the SS7 Gateway A7 version 1.0.92.0 dated 12/05/2001. For E1 applications we recommend that you use SS7 Gateway C7 version 1.0.91.5 dated 12/21/2001.

SS7 Description

SS7 is a common channel signaling system that provides flexibility in handling data calls as they enter the Public Switched Telephone Network (PSTN).

The PSTN was originally designed to handle voice calls. The expanded use of the Internet and Remote Access Servers (RAS) greatly increased the number of data calls entering the PSTN. This increase causes congestion at the terminating End Office (EO) because the data calls, on average, last longer than voice calls. An SS7 signaling gateway, working with the CommWorks Total Control® 1000 Enhanced Data System, offers a solution to this congestion. It recognizes data calls and can redirect them from the PSTN to a separate data network before they arrive at the terminating EO. Without SS7, there is no option to reroute these calls.

SLAP Protocol

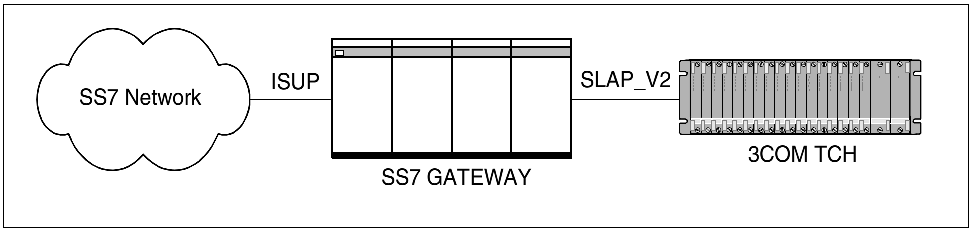
The SS7 Gateway employs Signaling LAN Application Protocol (SLAP) to link the SS7 network to the Total Control 1000 system. SLAP, a CommWorks proprietary protocol, is the interface between the access router card and the external SS7 Gateway system. It replaces the D-channel signaling that normally exists in an ISDN PRI interface and also defines the messages to facilitate system start up, shut down, and error recovery.

ENFAS Protocol

With SS7, the modem card continues to terminate the T1/E1 spans, but without having to handle any signaling associated with the span. Instead, the modem card takes the signaling from the router card (the router card gets it over the SLAP connection from gateway) over the packet bus through Enhanced Non-facility Associated Signaling (ENFAS) Protocol. ENFAS is the interface between the access router card and the individual modem cards.

The following figure illustrates how the Total Control 1000 enhanced data system connects to an SS7 signaling gateway.

Figure 107 Total Control 1000 SS7 Block Diagram



CAUTION: *Please configure the SS7 signaling gateway according to your customized needs before configuring the access router card and the modem cards for SS7 signaling services.*

SS7

In the Total Control 1000 enhanced data system, the access router card is the communications link to an external signaling device.

The access router card:

- Processes all communication traffic between the external signaling translator and a signaling termination point within the Total Control 1000 system.
- Translates external protocols into internal protocols and internal protocols into external protocols.
- Obtains Total Control 1000 system-wide information and reporting it to the external gateway.
- Represents the Total Control 1000 system to the SS7 Gateway.
- Manages the health of the IP network signaling connection.

In order for your Total Control 1000 to accept calls from the SS7 network through the signaling gateway, configure the signaling gateway first.

Next, install the correct application software on the following Total Control 1000 cards:

- DSP multispan modem card (Refer to Initial Configuration—SS7 Signaling chapter.)
- Access router card

Accessing the Command Line Interface

This section contains procedures for physically connecting the access router card to a local workstation running terminal emulation software to access the command line interface (CLI) menu. For information on configuring the access router card remotely, refer to the *Access Router Card 5.5 Command Line Interface Reference*.

The procedures have two parts:

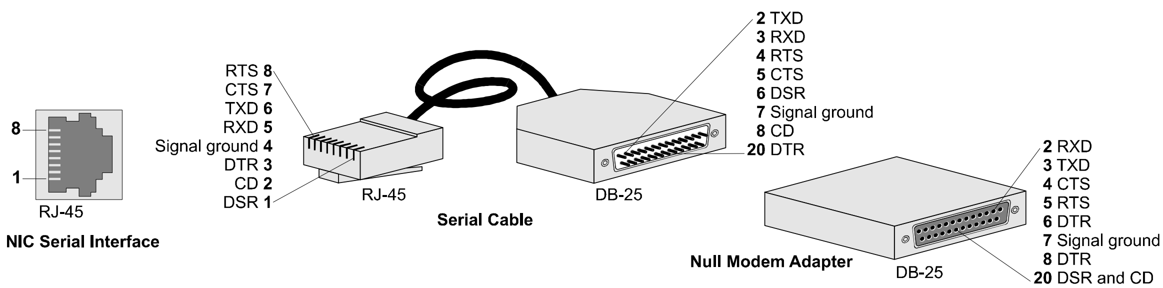
- Cabling
- Accessing the terminal emulation software

Cabling

You must first attach the access router card to your local workstation.

1. Connect the DB-25 (male) end of the cable shown in Figure 108 to the null modem adapter (female) that was supplied in the original packaging.
2. Connect the RJ-45 end of the cable shown in Figure 108 to the console port on the access router card Network Interface Card (NIC). The NIC is located in the rear of the Total Control 1000 chassis. The console port is the topmost port on the NIC.

Figure 108 Serial Connection Pinouts



3. Connect the null modem adapter directly to a serial port on the computer, or to an EIA-232 cable connected to a serial port on the computer.

Accessing the Terminal Emulation Software

After you have the cables connected, the next step is to run a terminal emulation software package. A familiar one is HyperTerminal.

1. Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.
2. Configure the communications application to use the COM port the serial cable is connected to.

Use the following table to determine the settings.

Table 20 Console Port Serial Communication Settings

Setting	Variable
Port speed	9600 bps (default)
Terminal type	VT100
Data bits	8
Parity	None
Stop bits	1
Flow control	None

3 At the terminal screen, Type in your login and password.

After you log in you get the access router card's CLI **root command prompt**.

Figure 109 Access Router Card CLI Login

```
Login:
Password:
HiPer>>
```

Configuring SS7 Signaling on the Access Router Card

This chapter explains how to make your Total Control system enabled for SS7.

Before configuring the access router card for SS7 signaling support, make sure you have configured your SS7 signaling gateway.

You must use either the CLI or Common Element Manager to configure, maintain, or trouble clear SS7 signaling configurations on the access router card.

Use common element manager to configure SS7 in the router card through Simple Network Management Protocol (SNMP). See the SS7 chapter in the *Access Router Card Command Line Interface Reference* for all supported CLI commands.

Verifying for SS7-enabled Software

SS7 functionality is an optional feature that must be purchased separately.

You can verify if SS7 has been enabled on the selected access router card using either the common element manager, or the CLI.

Common Element Manager

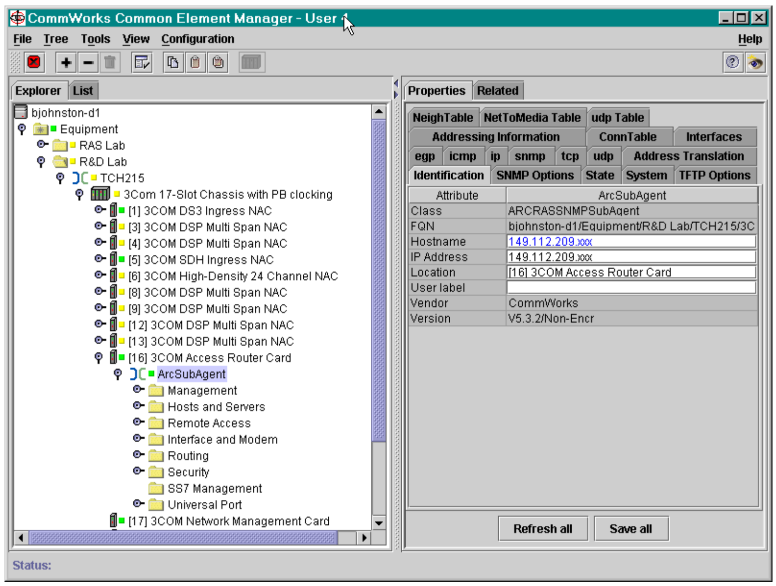
To verify SS7 is on the access router card using common element manager:

1 Click the **ArcSubAgent** on the access router card.

2 Click the **Identification** tab.

The **ArcSubAgent Identification** window displays showing the current settings.

Figure 110 ArcSubAgent Identification Window



The Version attribute field must indicate that SS7 is included in the version of the software on the access router card. In the example above it is version V5.5.6/Max56-Encr/SS7.

Command Line Interface

To determine if your access router card has the SS7-enabled software installed enter the following CLI command:

1 Enter the following command from the access router card's CLI:

```
show system settings
```

2 Look at the line that lists the system version as shown below.

```
System Version: V5 .0.n/MAX56-Encr/SS7
```

If the System Version ends with SS7, as shown above, then your access router card is SS7-enabled.

Configuring the Access Router Card for SLAP

You can configure SS7 on the selected access router card using either the common element manager, or the CLI.

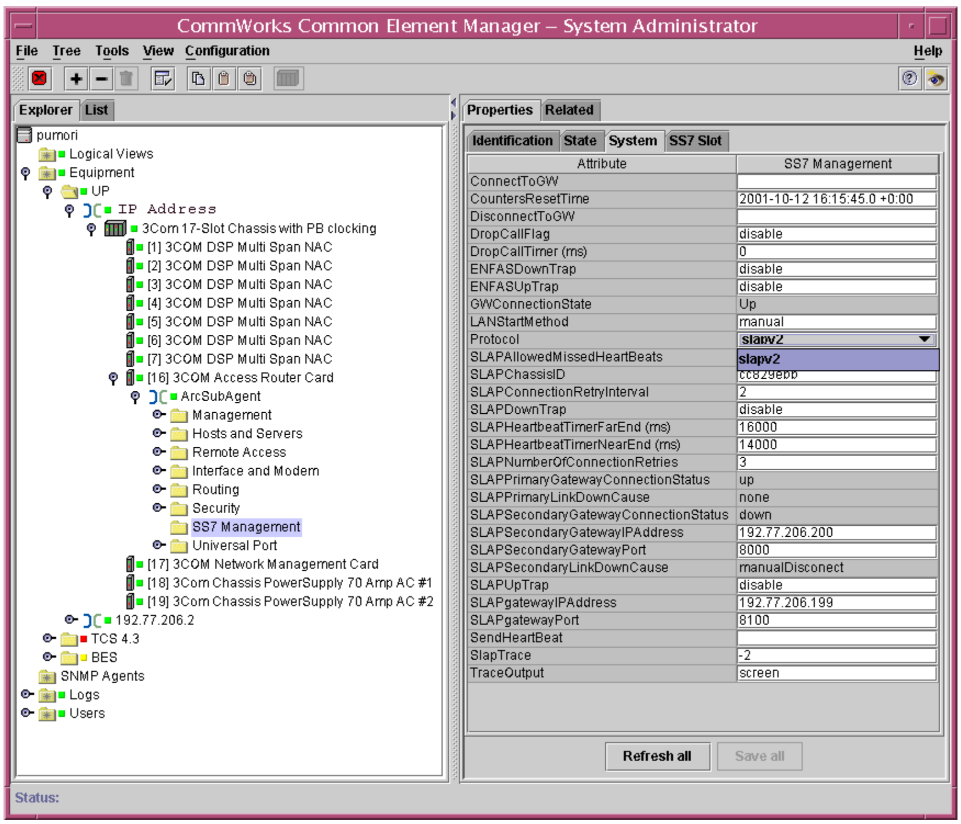
Common Element Manager

If you are using the common element manager, all of the parameters are found on the System tab of the SS7 Management folder.

1 Select the SS7 Management folder under ArcSubAgent.

2 Double-click the **Protocol** field on the System tab.

Figure 111 Setting the SS7 Protocol



3 Select **slapv2** from the drop down menu.

4 Click **Save all**.

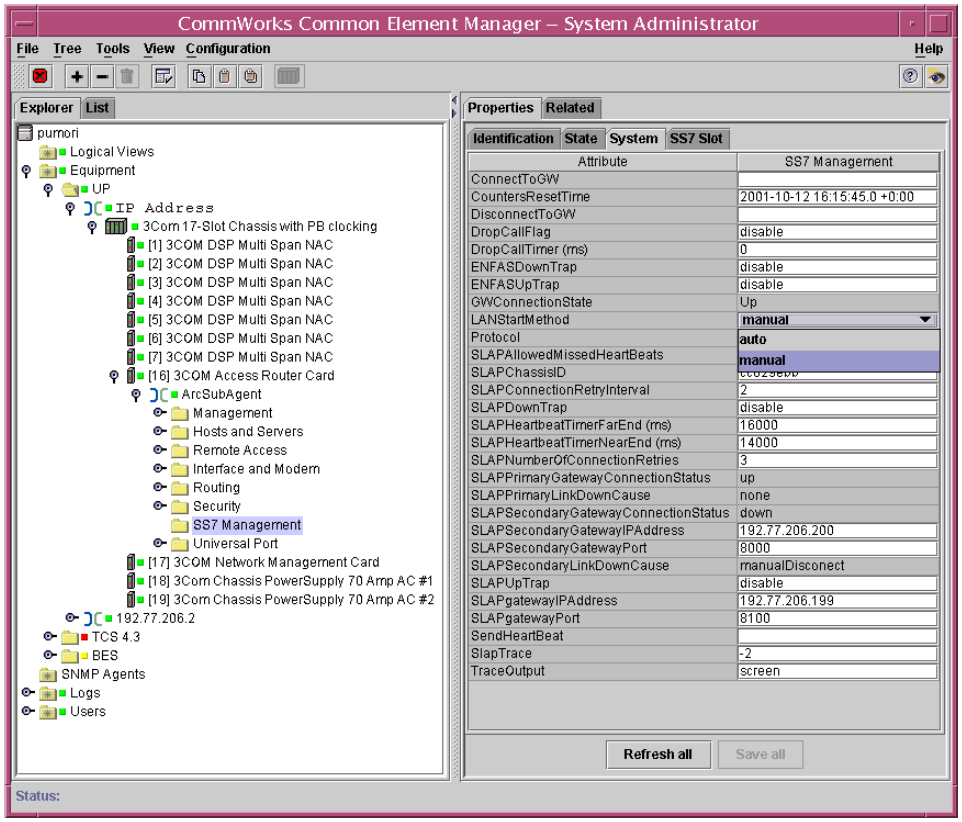
At this time only the SLAP V2 protocol is supported for communication with SS7 Gateways.

Set the protocol used to communicate with SS7 Gateways to manual.

1 Select the SS7 Management folder under ArcSubAgent.

2 Double-click the **LANStartMethod** field on the System tab.

Figure 112 Setting the SS7 Protocol



3 Select **manual** from the drop down menu.

4 Click **Save all**.

Command Line Interface

To configure the access router card for SLAP using CLI:

1 To set the SS7 protocol, type:

```
set ss7 protocol [slap_v2]
```

At this time only the SLAP V2 protocol is supported for communication with SS7 Gateways.

2 To set the startup method type:

```
set ss7 startup_method < MANUAL >
```

Set the start up method to Manual until the SS7 Gateway is properly configured for the Total Control 1000 hubs it is connected to.

Additional attributes that need to be set on the System tab are listed in Table 22. The remaining attributes can be set to further customize your system.

However, it is not necessary in order for the access router card to accept a SS7 signal. Refer to Table 21 for a complete explanation of all the remaining attributes.

Double-click on parameter's input field to reveal the drop-down list and select the values listed in the table.

The following table lists the additional SS7-related attributes to set:

Table 21 SS7-related Parameter Settings

Attribute	Default Setting	Descriptions
SLAPChassisID	0	An ID uniquely identifying the logical chassis represented by the access router card and the DSP multispan under its service. This must be a unique string of a minimum of two and a maximum of eight hexadecimal characters for the Chassis ID. You must also use an even number of characters. One suggested way of creating a unique Chassis ID is to convert your the access router card IP address from dotted decimal to hexadecimal.
SLAPHeartbeat TimerFarEnd (ms)	15000 milliseconds	The timer should be coordinated with the far end heartbeat timer found in the SS7 Gateway. The timer value should not be set below 500 milliseconds.
SLAPHeartbeatTimerNearEnd (ms)	15000 milliseconds	The timer should be coordinated with the near end heartbeat timer found in the SS7 Gateway. The timer value should not be set below 500 milliseconds.
SLAPgatewayIPAddress	0.0.0.0	The IP address of the primary external SS7 Gateway.
SLAPgatewayPort	8000	The port address of the primary external SS7 Gateway
SLAPSecondaryGatewayIPAddress	0.0.0.0	The IP address of the secondary external SS7 Gateway.
SLAPSecondaryGatewayPort	8000	The port address of the secondary external SS7 Gateway

The remaining parameters that need to be set are:

1 Type:

```
set ss7 slap_v2

chassis_id <n>,

heartbeat_timer_far_end <1, 4294967295>

heartbeat_timer_near_end <1, 4294967295>

primary_host <ip_name_or_addr>

primary_host_port <port>

secondary_host <ip_name_or_addr>

secondary_host_port <port>
```

2 Other parameters that you may want to set are:

```
gateway_retry_count <1, 65535>

gateway_retry_interval <1, 65535>

heartbeat_threshold < 0, 65535>

Drop_Call_On_Signal_Loss <enabled, disabled>

Drop_Call_Timer <0, 4294967295>
```

These commands set the remaining SLAP parameters as described below.

Table 22 SLAP Configuration Parameters

Parameter	Default Setting	Reset?	Descriptions
Chassis ID	0	Yes	An ID uniquely identifying the logical chassis represented by the access router card and the DSP multispan under its service. If you are using Common Element Manager to configure this card, you must use a unique string of a minimum of two and a maximum of eight hexadecimal characters for the Chassis ID. You must also use an even number of characters. One suggested way of creating a unique Chassis ID is to convert your the access router card IP address from dotted decimal to hexadecimal.
Primary Gateway IP Address	0.0.0.0	Yes	The IP address of the primary external SS7 Gateway.
Primary Gateway Port Number	8000	Yes	The port address of the primary external SS7 Gateway
Secondary Gateway IP Address	0.0.0.0	Yes	The IP address of the secondary external SS7 Gateway.
Secondary Gateway Port Number	8000	Yes	The port address of the secondary external SS7 Gateway
TCP/IP Connection Start Method	Manual	If needed	The method used by the access router card to bring up the TCP/IP connection to the external signaling gateway host at bootup time.
Heartbeat Timer (Near End).	15000 milliseconds	If needed	The timer should be coordinated with the near end heartbeat timer found in the SS7 Gateway. The timer value should not be set below 500 milliseconds.
Heartbeat Timer (Far End)	15000 milliseconds	If needed	The timer should be coordinated with the far end heartbeat timer found in the SS7 Gateway. The timer value should not be set below 500 milliseconds.
Gateway Connection Retry Count	3	If needed	The total number of connection retry attempts the access router card makes to the primary gateway IP address before trying the secondary IP address. It makes the same number of attempts with the secondary address and if that fails it continue with primary gateway. The retry only works when "start mode" is set to "auto".
Gateway Connection Retry Interval	2 seconds	If needed	The time interval in which attempts to reconnect are made.

Table 22 SLAP Configuration Parameters (continued)

Parameter	Default Setting	Reset?	Descriptions
Number of Heartbeat Absences threshold	1	If needed	The number of heartbeat messages the access router card can miss from the external SS7 Gateway before initiating a recovery procedure.
Drop Calls on Signal Loss	Disabled	If needed	if this is enabled, the access router card drops all the calls when the SLAP connection to the Gateway is lost and could not re-establish within the "Drop Call Timer" value.
Drop Call Timer	0 milliseconds	If needed	When the SS7 Gateway connection is lost and if "Drop Call on Signal loss" Flag is set the access router card drops all the calls if it could not re-establish the signaling connection within this "Drop Call Timer". A value of 0 means drop the calls immediately.
Gateway External Signaling Protocol	SLAP	No	The protocol running over the TCP/IP connection with the external signaling gateway.

Associating DSP Multispan Signalling

Unlike the DSP multispan modem card, the access router card can be configured to perform ENFAS signaling to selective DSP multispan cards. This means that if there are multiple access router cards in a chassis, either all of the access router cards can do the SS7 functionality or just one the access router card can do it for all of the DSP multispan cards, depending on the configurations. The default configuration is Dynamic management, the signaling association of the access router card with DSP multispan cards is dynamically linked with Data Association.

You use either the CLI or Common Element Manager to configure the access router card to DSP multispan Signaling Association.

Common Element Manager

Use Common Element Manager to configure SS7 in the router card through Simple Network Management Protocol (SNMP).

Command Line Interface

Use CLI to issue various commands for configuring, maintaining or trouble clearing the chassis as described below. See the SS7 chapter in the *Access Router Card Command Line Interface Reference* for additional CLI commands.

Configuring the Access Router Card to DSP Multispan Signalling Association

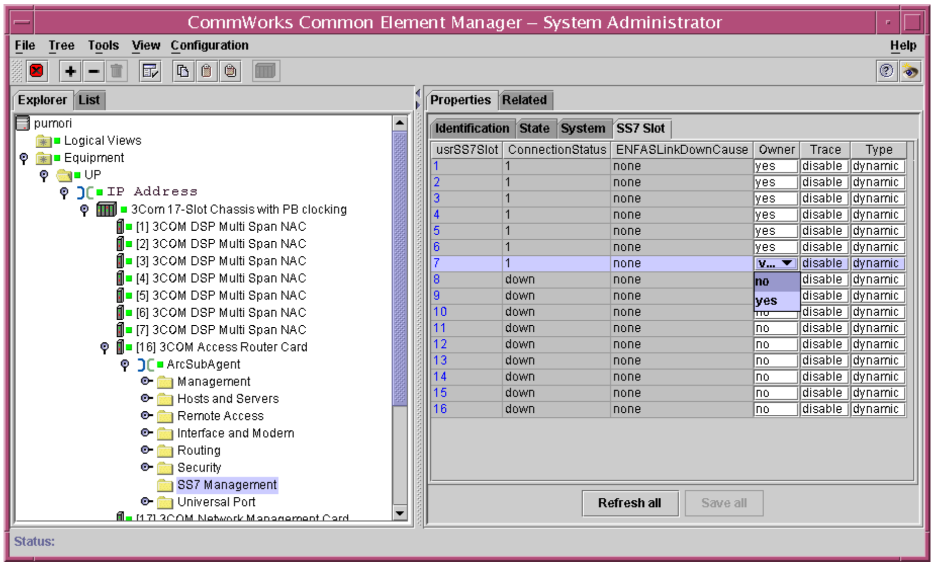
To associate the access router card to the DSP multispan signalling use either the common element manager or the CLI.

Common Element Manager

To configure the access router card to DSP multispan Signaling Association using common element manager:

1. Select the SS7 Management folder under ArcSubAgent.
2. Double-click the **SS7 Slot** tab.

Figure 113 SS7 DSP Multispan to Access Router Card Association



3 Select **Owner** and **Type** to configure the assignments for your system from the drop down menu. Refer to Table 23 for information on how the access router card will manage the DSP multispan card.

4 Click **Save all**.

Table 23 shows parameters that can be set to configure how the access router card manages the DSP multispans.

Table 23 SS7 DSP Configuration Parameters

Parameter	Default Setting	Reset?	Description
Owner	No	If needed	This parameter decides ownership for a particular DSP multispan in the slot. If the Owner is "Yes" the access router card opens an ENFAS connection to that slot when a SLAP connection is established.
Type	Dynamic	If needed	This decides how to assign the ownership. Dynamic: By chassis awareness. The assignment is done by the Network Management Card. Static: Use this setting if you want a static configuration.

Command Line Interface

Refer to Table 23 for information on how the access router card manages the DSP multispan card.

To configure the access router card to DSP multispan Signaling Association using CLI:

1 Type:

```
set ss7 slot <slot_list> owner [no | yes] type [dynamic
| static]
```

The value slot_list is a value from 1 to 16. This can be a single slot value or a range like 1-16.

For example; Assume that there are two access router cards in the Chassis at slot 11 and 12 and ten DSP multispans from slot 1 to slot 10.

- Case 1: Each the access router card does the SS7 signaling for all the DSP multispan it owns for data.

  Leave the configuration to default (Dynamic). The network management card assigns the dynamic configuration.
- Case 2: One the access router card does all the Signaling. One the access router card is the SS7 owner of all the DSP multispans.

2 Type:

`set ss7 slot 1-10 owner yes type static.`

The following information pertains to dynamic slot assignment and SS7.

- If there are two access router cards in the chassis, then Dynamic Slot Assignment (DSA) has to be enabled for chassis awareness to work. Use the command **show nmc** to see the current configuration.
- If DSA is enabled then DO NOT configure the ss7 slot ownership to static. Let the SS7 signaling association move along with the Data Association.

For example:

If one of the access router card goes out of service, then the network management card assigns the ownership of the DSP multispan that belonged to the non-functional the access router card to the other the access router card. If signaling is not moved along with the new assignment of ownership, the DSP multispans are not be able to accept calls.

Connecting and Disconnecting from the SS7 Gateway

To make manual connections to the SS7 gateway and the access router card use either the common element manager or the CLI.

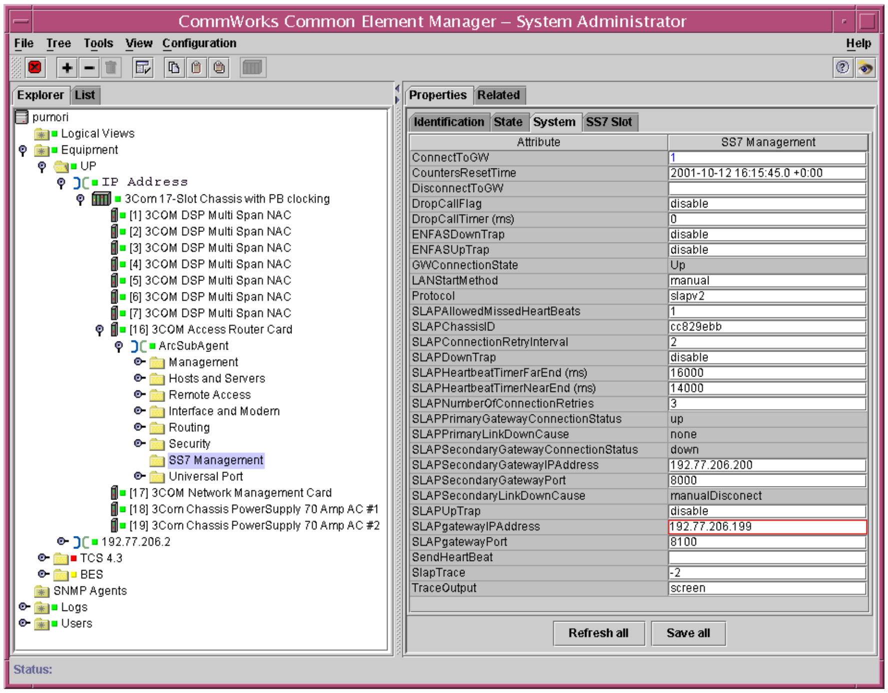
Common Element Manager

To connect the access router card to the SS7 Gateway using common element manager:

1 Select the **SS7 Management** folder under ArcSubAgent.

2 Double-click the **System** tab.

Figure 114 Connecting to the SS7 Gateway



3 Enter **1** in the ConnectToGW field.

4 Click **Save All**.

To disconnect the access router card to the SS7 Gateway using common element manager:

1 Select the **SS7 Management** folder under ArcSubAgent.

2 Double-click the **System** tab.

3 Enter **1** in the DisconnectToGW field.

4 Click **Save All**.

Command Line Interface

To connect and disconnect the access router card to the SS7 Gateway using CLI use the following commands:

Table 24 Making Manual Connections to the SS7 Gateway

Command	Function
connect ss7 gateway	Connects the access router card to the SS7 Gateway
disconnect ss7 gateway	Disconnects the access router card from the SS7 Gateway, or ends connection attempts.
connect ss7 slot <slot_list>	Connects the SS7 Gateway to the access router card in a particular slot.
disconnect ss7 slot <slot_list>	Disconnects the SS7 connection to the slot, or ends connection attempts.

Configuring SLAP Connection Fail Over

Up to two SS7 Gateways can be configured for fail over switching. They are called primary and secondary.

The following parameters can effect fail over behavior.

- Retry count when the access router card loses connection to SS7 Gateway (default is 3)
- Time interval between retries (default is 2 seconds)
- Heartbeat threshold (default is 1)
- Slap startup mode (default is: Manual)

Scenarios

The following scenarios describe events that may cause SLAP connection fail over to occur when connection attempts to the SS7 Gateway fail for different reasons.

Scenario 1: (first time)

When the access router card come up for the first time (after a reboot or software down load) and has valid configurable parameters for SLAP then it looks at the start mode 30 seconds after the boot up.

If start the mode is:

- AUTO—the access router card tries to connect to the primary SS7 Gateway "Retry count” times with "retry interval" seconds between retries before switching over to the secondary SS7 Gateway. It does the same thing on the secondary SS7 Gateway before switching over to the primary SS7 Gateway. This process repeats until it successfully connects to an SS7 Gateway.
- Manual—With this option, initiate the connection to the SS7 Gateway by executing the command **connect ss7 gateway** from the console. It follows the same algorithm as above to connect to the SS7 Gateway.

Scenario 2: (HeartBeat missing, crossed Heartbeat threshold)

The access router card closes the socket connection to the SS7 Gateway that it is currently connected to and checks the startup method.

If start mode is:

- AUTO—the access router card waits for "Retry interval" seconds before trying 'Retry count' times to connect to the same SS7 Gateway that it was connected to before it closed the socket connection. If it is not able to connect to that SS7 Gateway, then it tries the other SS7 Gateway for 'Retry count' times. This goes forever until connection to the SS7 Gateway is established.

- Manual—It does nothing if SLAP start mode is Manual. User needs to start the connection by invoking the command **connect ss7 gateway**.

Scenario 3: (SS7 Gateway disconnects while in operation)

- The access router card waits for "Retry interval" seconds
- The access router card switches the gateway and tries to connect to the other SS7 Gateway for 'Retry count' times. If it fails to connect to that SS7 Gateway then it tries to connect to the other SS7 Gateway for 'Retry count' times. This process continues until connection to the SS7 Gateway is established. This happens regardless of startup method.

For example; assume the access router card is currently connected to the Primary SS7 Gateway and the SS7 Gateway crashes. The access router card detects the loss of the connection and does the following.

- Waits for "Retry interval" seconds (default 2 seconds).
- Tries to connect to the Secondary SS7 Gateway for "retry count" (default 3) times with "retry interval" (default of 2) seconds in between each attempt.
- If this fails, the access router card tries to connect to the primary SS7 Gateway and it continues until it the connection is established.

SNMP Traps

The access router card can be configured to send SNMP traps in the case of certain events described in Table 25.

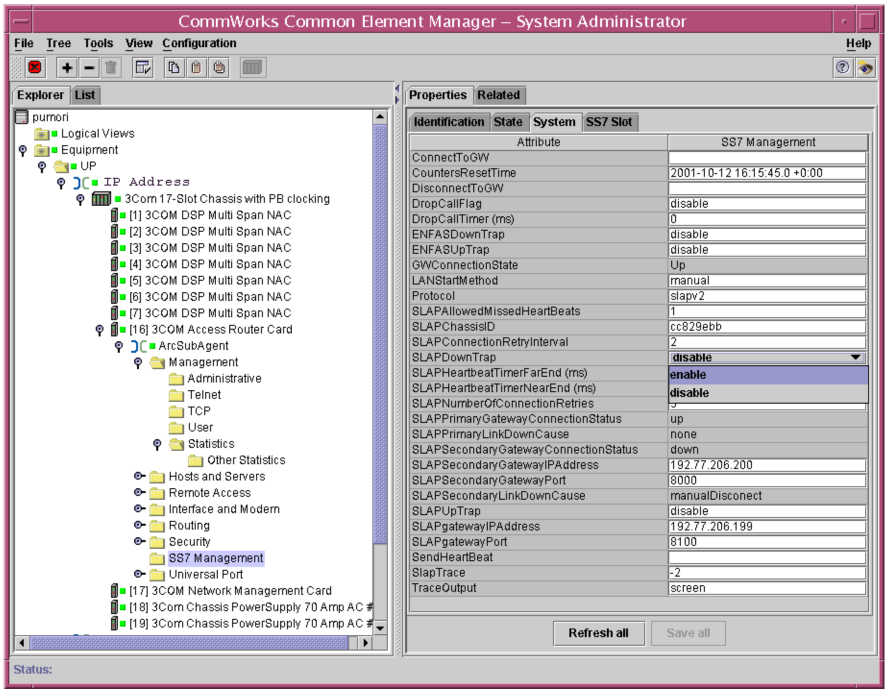
Table 25 SNMP Traps

Parameter	Default Setting	Reset?	Description
SLAP Up Trap	Disabled	If desired	SNMP trap is generated when SLAP Connection to the SS7 Gateway is established.
SLAP Down Trap	Disabled	If desired	SNMP trap is generated when SLAP Connection to the SS7 Gateway is disconnected
ENFAS Up Trap	Disabled	If desired	SNMP trap is generated when ENFAS Connection to the slot is established.
ENFAS Down Trap	Disabled	If desired	SNMP trap is generated when ENFAS Connection to the slot is disconnected.

To set the trap commands using common element manager:

1. Select the **SS7 Management** folder under ArcSubAgent.
2. Double-click the **System** tab.

Figure 115 Connecting to the SS7 Gateway



3 Enable the traps that you want set by doubling clicking on the associated input field. Refer to Table 25 for the description of the traps.

4 Click **Save All**.

The following CLI commands enable and disable SS7 traps related to the access router card. For a complete description of all the commands for the access router card, including the SS7 trap commands, refer to the *Access Router Card Command Line Interface Reference Guide*.

- enable ss7 slap_down_trap
- enable ss7 slap_up_trap
- enable ss7 slot_down_trap
- enable ss7 slot_up_trap
- disable ss7 slap_down_trap
- disable ss7 slap_up_trap
- disable ss7 slot_down_trap
- disable ss7 slot_up_trap

This command displays the current configuration of all SS7-related traps:

```
show ss7 trap status
```

Displays the current configuration of the traps as shown below.

```
HiPer>> show ss7 trap status

Gateway UP Trap: DISABLED

Gateway Down Trap: ENABLED

Slot UP Trap: DISABLED

Slot Down Trap: DISABLED
```

Make sure the access router card is configured with an SNMP trap community. Use the command **list snmp trap_communities** to see the trap configuration. Refer to the *Access Router Card Command Line Interface Reference* for more information on setting trap communities.

Saving the Configurations

When you finish configuring the access router card you must save the configuration before it will take effect. You can do this using either the common element manager or the CLI. For more information on saving configurations, refer to the *Operations Guide*.

Common Element Manager

To save the new configurations using common element manager:

1. Click **Save all** on the Configuration tab window.
2. Right-click the access router card.
3. Select **Save to NVRAM** on the Configuration pop-up list.
4. Right-click the chassis.
5. Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

Command Line Interface

To save the new configurations using CLI:

1. Entering the following command.

   `HiPer>>save all`

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

   `>` **`reboot`**

IV

DSP MULTISPAN CARD

Chapter 11 DSP Multispan Card Overview

Chapter 12 Installing the DSP Multispan Card Set

Chapter 13 Initial Configuration—Channelized T1

Chapter 14 Initial Configuration—T1 Primary Rate Interface

Chapter 15 Initial Configuration—Channelised E1 (R2)

Chapter 16 Initial Configuration—E1 Primary Rate Interface

Chapter 17 Initial Configuration—SS7 Signaling

11 DSP MULTISPAN CARD OVERVIEW

This chapter provides an overview of the DSP multispan T1/E1 card set, including product description, configuration, and product compatibility information.

Unless otherwise specified, all references to the DSP multispan card also apply to the HiPer DSP card.

This chapter contains the following topics:

- Product Description
- Product Compatibility

Product Description

The CommWorks Total Control® 1000 Enhanced Data System is a powerful data communications platform that can support a broad variety of applications. The applications that can be accommodated are governed by the Network Application Cards (NACs) and Network Interface Card (NIC)s installed in the chassis midplane.

The DSP multispan modem card set includes a front-loaded NAC and an associated rear-loaded NIC. Depending on your application needs, the DSP multispan NAC/NIC card set provides Wide Area Network (WAN) ingress access through four T1 spans located on a DSP multispan T1 NIC or three E1 spans located on a DSP multispan E1 NIC.

Incoming calls terminate on highly integrated modems found within the DSP multispan. Users receive WAN access either through Pulse Code Modulated (PCM) encoded analog calls converted to baseband or through ISDN digital data calls.

Once modems process analog and digital calls, the DSP multispan NAC passes the data across the Packet Bus to the access router card. The access router card performs encryption and standard routing functions.

Scalability

Since both the hardware and software are scalable, any volume increase in the network can be addressed by reconfiguring the software or upgrading the system hardware to create a more powerful system.

The DSP multispan card set can accommodate increased port density and port throughput upgrades across platforms without major architecture modifications. Currently, the DSP multispan card set supports 96 ports per modem module for T1 applications and 90 ports per modem module for E1 applications.

Hardware Standards

The DSP multispan T1/E1 NIC provides the physical interface to terminate four T1 or three E1 span lines for the DSP multispan NAC. The DSP multispan NIC is configurable to accommodate long and short cable lengths.

In addition, the DSP multispan T1/E1 NIC contains two RS-232 serial interfaces. The Console port allows the user to configure the DSP multispan NAC through the command line interface (CLI), and the AUX port may be used to perform software downloads. See Table 26 for a detailed description of the card's face plate.

Refer to the Total Control 1000 Enhanced Data System Operations Guide *for more information regarding the interworking functions of the DSP modem architecture.*

The DSP multispan NAC is a modem card that terminates analog and digital calls and communicates data to and from the access router card. The DSP multispan NAC possesses a four span modem architecture containing 96 port options for T1 applications and a three span modem architecture containing 90 port options for E1 applications.

You can provide WAN ingress access through four T1 spans (or three E1 spans) located on a DSP multispan NIC. You can also terminate calls on T3 span lines by using the optional DS-3 ingress card set. This allows you to configure and manage your Total Control 1000 hub according to your customized needs.

Physical Interfaces

The DSP multispan NAC is physically comprised of a NAC baseboard and modem modules. The baseboard not only provides board management, Peripheral Component Interconnection (PCI), and ingress and egress infrastructure for the card, but it also acts as a motherboard for multiple modem modules. Each modem module provides module coprocessor and DSP subsystems.

The DSP multispan NAC supports the following physical interfaces. A description of each interface type is listed below.

- System Interfaces
  - Management Bus
  - Time Division Multiplexed (TDM) Bus
  - Packet Bus

- CPU Components
  - Board Manager RISC Processor
  - Modem Module RISC Coprocessor Subsystem

- LED Interface
- Other physical interfaces

System Interfaces

DSP multispan NACs are connected to several system interfaces that allow them to communicate with other NACs in the Total Control 1000 hub.

For example, the Total Control TDM Bus provides communication between DSP multispan NACs. Through the Packet Bus, the DSP multispan NAC sends packets of digitized information to and from other NACs in the Total Control 1000 hub.

CPU Components

The DSP multispan NAC supports a Reduced Instruction Set Computer (RISC) Central Processing Unit (CPU) composed of one Board Manager RISC Processor and four Modem Module RISC Coprocessor daughterboard. The Board Manager RISC Processor communicates with the four Modem Module RISC Coprocessors through the Peripheral Component Interconnection (PCI) Bus interface. This highly integrated microprocessor architecture greatly increases the NAC's performance and provides NAC Board Manager supervisor functions.

LED Interface

The following figure shows the eight Light Emitting Diodes (LEDs) on the DSP multispan NAC's front panel. LEDs provide valuable information that helps indicate channel utilization and board level status. As shown in Figure 116, LEDs are available for all four modem spans. Each LED is explained in Table 26.

Figure 116 DSP Multispan NAC LED Interface

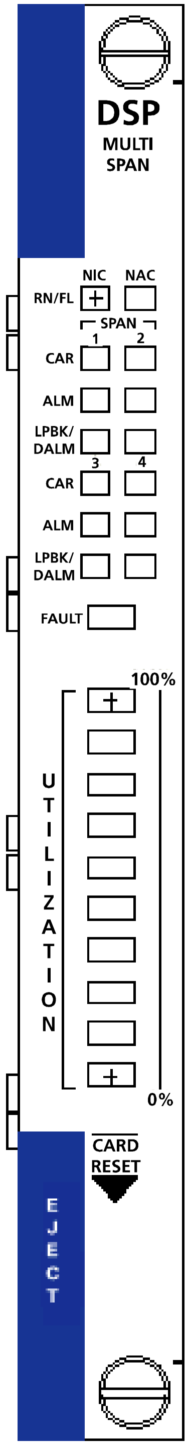


Table 26 references the LEDs in graphic Figure 116 above.

Table 26 DSP Multispan NAC LED References

LED	Color	Description
RN/FL	green	Card has completed the Power On Self Test (POST).
	flashing green	Diagnostics running or downloading code.
	red	Card failed.
	flashing yellow	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/DALM	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	yellow	There is a problem in one or more modems. See the Trouble Locating and Clearing appendix for more information.
	red	There is a critical problem in one or more modems, or the NAC in general.
	none	The modems are configured correctly
UTILIZATION	off	Modems are not in use.
	green	Modems in use; the ten utilization LEDs indicate the percentage of modems on DSP multispan in use (0-100%).

Applications

The DSP multispan NIC, when integrated into the Total Control 1000 Enhanced Data System, provides the following applications for Internet Service Providers (ISPs) and various corporations.

For ISPs, the DSP multispan card set provides the following applications:

- Dial-in and dial-out Internet access
- Managed remote access
- Flexibility to be used in the following environments:
  - Analog
  - Frame Relay
  - Ethernet
  - ISDN

For universities, financial institutions, health care companies and other corporations, the DSP multispan card set allows remote users to access the following resources:

- E-mail
- Internet
- Databases

Product Compatibility

The DSP multispan NAC is compatible with the following hardware components.

NIC Compatibility

The DSP multispan NAC is compatible with the following NICs:

- DSP multispan T1 NIC with 4 RJ-48C connectors
- DSP multispan E1 NIC with 3 RJ-48C connectors

Total Control 1000 Compatibility

The DSP multispan NAC is compatible with the following Total Control 1000 products:

- DS-3 ingress NAC
- DS-3 ingresss NIC
- HiPer™ ARC NAC
- Access Router Card
- HiPer NMC (with Total Control Manager)
- Network Management Card (with Total Control Manager)

DSP Compatibility

The DSP multispan NAC will coexist with the following DSP products:

- HiPer DSP T1 NAC
- HiPer DSP E1 NAC
- HiPer DSP T1/E1 NIC

Software Compatibility

Make sure the correct software version is installed on your DSP multispan NAC. Older software versions are not compatible with the Total Control 1000 DSP multispan card set. To check software compatibility, refer to the "Total Control Software Compatibility Matrix" found on CommWorks Technical Support website http://totalservice.commworks.com. If you have a new DSP multispan, the most current software is already installed on the card.

For detailed instructions on downloading the most current software version, refer to the Total Control 1000 Enhanced Data System *Maintenance Guide*. Use the Software Download-2 (SDL-2) utility to download software to the DSP multispan.

12 INSTALLING THE DSP MULTISPAN CARD SET

This chapter contains installation requirements, procedures, and verification of the installation for the DSP multispan card.

Unless otherwise specified, all references to the DSP multispan card also apply to the HiPer DSP card.

This chapter contains the following topics:

- Installation Requirements
- Installation Procedure
- Network Cabling
- Installation Verification
- Post Installation Procedures

For assistance in troubleshooting the DSP multispan card refer to Appendix A, Trouble Locating and Clearing.

For the technical specifications for this card, refer to Appendix B, Technical Specifications.

Installation Requirements

The following section describes requirements necessary to install the DSP multispan Network Interface Card (NIC) and Network Application Card (NAC).

T1/E1 Applications

Standard T1/E1 lines terminate at span ports found on corresponding DSP multispan NICs. Before installing the DSP multispan NAC in a Total Control® 1000 chassis, install the corresponding NIC:

- DSP multispan T1 NIC with 4 RJ-48C connectors
- DSP multispan E1 NIC with 3 RJ-48C connectors

DS-3 Applications

If you plan on using DS-3 applications, you must add a DS-3 Ingress NAC/NIC card set to your chassis to terminate ingress DS-3 lines. DS-3 lines use a special cable connection not supported by standard DSP multispan T1/E1 NICs.

DSP multispan NACs supporting DS-3 ingress calls do not use DSP multispan T1/E1 NICs. DS-3 ingress calls enter through the DS-3 ingress NIC; the DS-3 ingress NAC processes these calls and terminates them on DSP multispan NAC modems. Therefore, the DSP multispan T1/E1 NIC slot will not be functional. Cover the empty slot with a blank safety panel as instructed below.

Installation Procedure

This section explains how to install the NIC and NAC set.

NIC Installation

To install this NIC:

ESD: To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the NIC.

Install the NIC with or without power applied to the chassis.

1 Configure the NIC via jumpers located on the side panel of the DSP multispan T1/E1 NIC.

The DSP multispan E1 NIC has two jumpers, affecting the following features:

- Digital Rate During Reset State
- Power On Loopback State

Figure 117 DSP Multispan T1/E1 NIC Jumpers

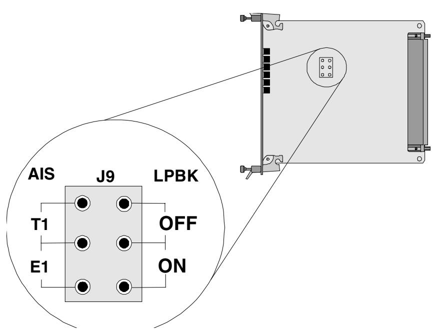


Table 27 identifies the items in Figure 118.

Table 27 Jumper Description

Jumper	Function
AIS T1/E1	Transmitting all Zeros. No jumper present.
AIS T1	Transmitting all Ones (AIS) in T1 Mode. *This is the T1 package factory default setting*

Table 27 Jumper Description (continued)

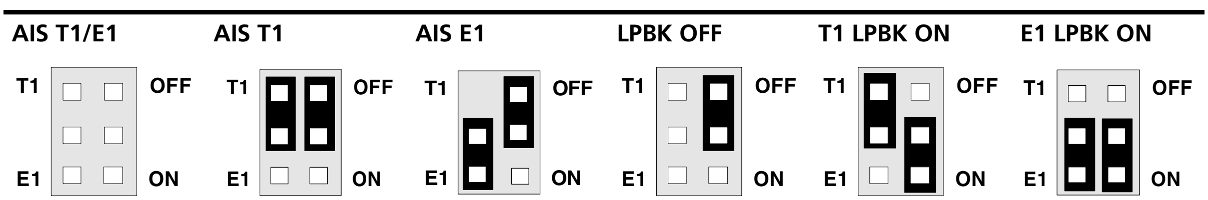
Jumper	**Function**
AIS E1	Transmitting all Ones (AIS) in E1 Mode. *This is the E1 package factory default setting*
LPBK OFF	Power ON Loopback Disabled. *This is the standard factory default setting*
LPBK ON	Power ON Loopback Enabled

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

Older versions of the modem T1/E1 NIC went into loopback when either the NAC was unplugged or when the NIC was otherwise held in reset. The new version of the modem T1/E1 NIC contains several configuration jumpers allowing the flexibility of controlling the NIC default actions under these two conditions.

Figure 118 identifies the different jumper settings.

Figure 118 Jumper Settings



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

To use loopback, you must select a span mode: T1 or E1. When neither span mode is selected, the NIC defaults 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 state of the NIC because it executed loopback mode.

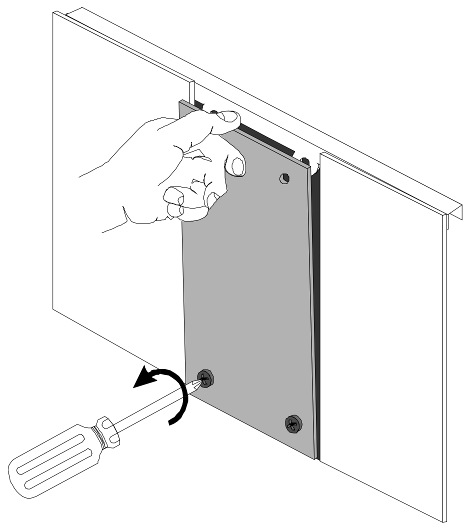
When unplugging and resetting the NIC, be sure to unplug and reset the DSP multispan NAC after resetting the NIC.

1 Select a slot (1-16) in the back of the Total Control 1000 chassis for installing the NIC.

For managed chassis, slot 17 is reserved for the network management card NIC.

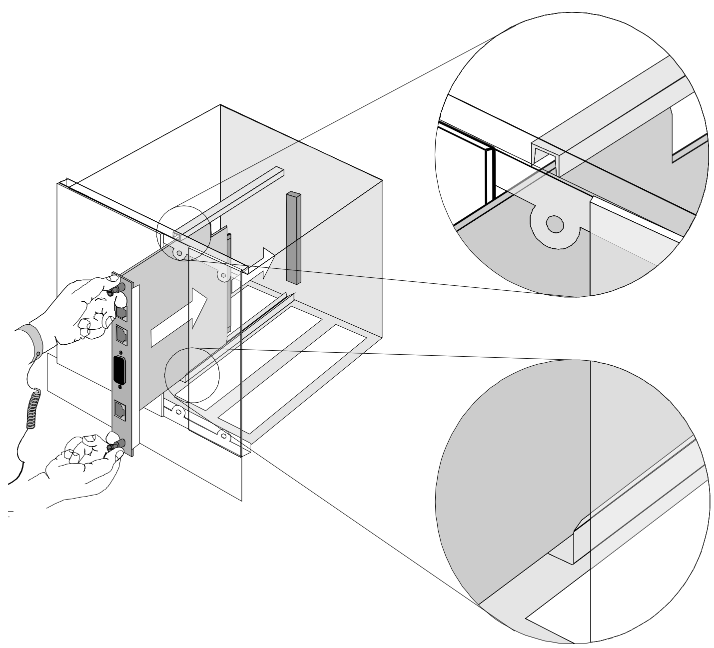
2 Use a #2 Phillips screwdriver to remove the safety panel covering this slot.

Figure 119 Removing the Safety Panel



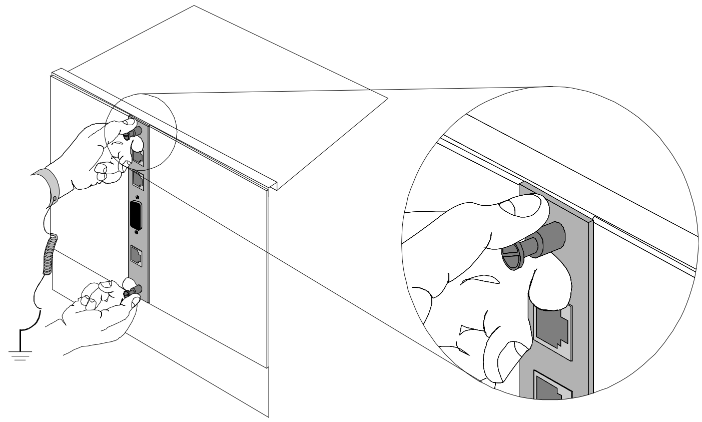
3 Insert the NIC between the slot's upper and lower card guides.

Figure 120 Inserting the NIC



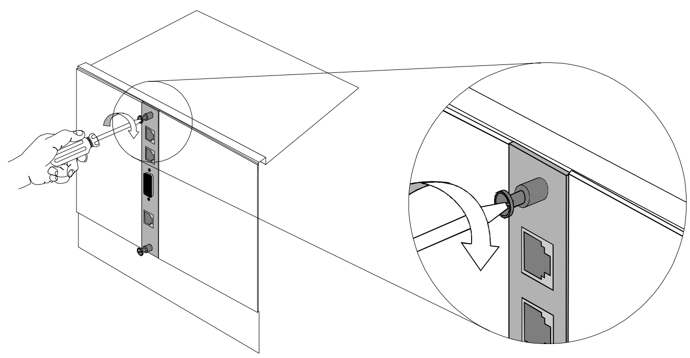
4 Slide the NIC into the chassis, until the front of the NIC is flush with the chassis.

Figure 121 Slide the NIC into the Chassis



5 Use a flat-head screwdriver to tighten the screws on the front panel.

Figure 122 Tighten the Screws



6 Cover any unused chassis slots with safety panels.

7 Install the Network Application Card (NAC) corresponding to this NIC.

NAC Installation

Follow these procedures to install the NAC successfully.

To install this NAC:

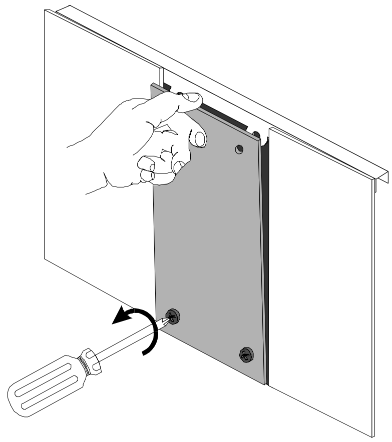
ESD: *To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the NAC.*

Install the NAC with or without power applied to the chassis.

1 Confirm that the NIC corresponding to this NAC is installed.

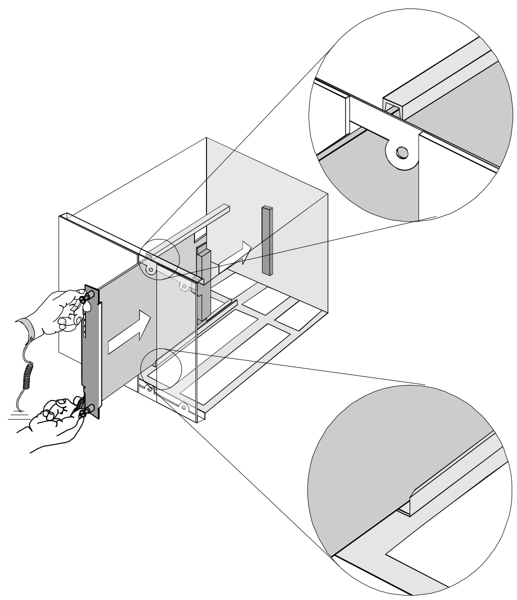
2 Use a #2 Phillips screwdriver to remove the safety panel covering this slot.

Figure 123 Removing the Safety Panel



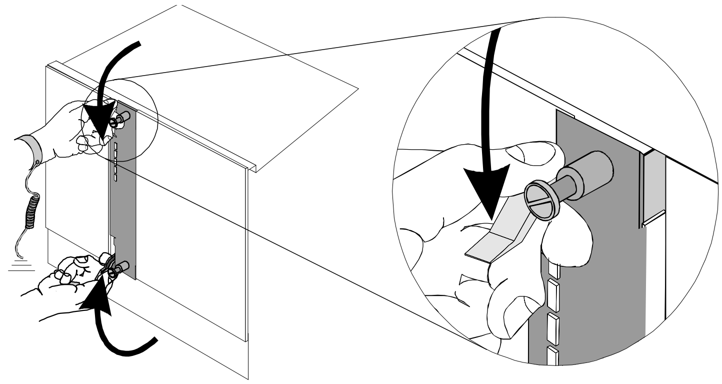
3 Insert the NAC between the slot's upper and lower card guides in the same numbered slot as the corresponding NIC.

Figure 124 Inserting the Network Application Card



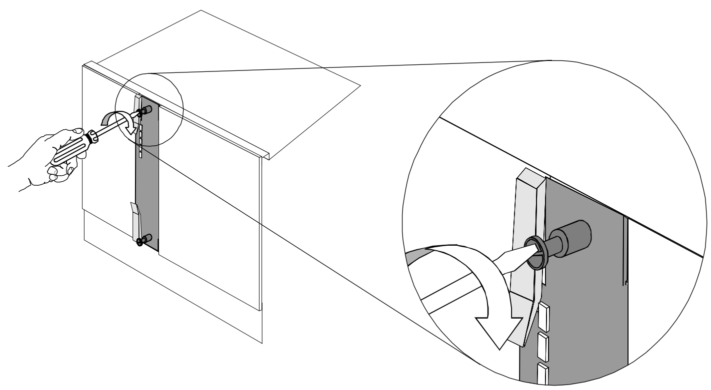
4 Holding the tabs perpendicular to the NAC's front panel, slide the NAC into the chassis, until the front of the NAC is flush with the chassis. Push the tabs toward each other to secure the NAC.

Figure 125 Securing the Network Application Card



5 Use a slotted screwdriver to tighten the screws on the front panel.

Figure 126 Tightening the Front Panel Screws



6 Cover any unused chassis slots with safety panels.

7 Apply power to the chassis, if power is not already applied.

Network Cabling

After physically inserting the DSP multispan NAC and NIC into the Total Control 1000 chassis you must cable the NIC to the Total Control 1000 chassis.

For T1 applications, the NIC uses four span ports. For E1 applications, the NIC uses three span ports. The diagram below shows DSP multispan T1 NIC interfaces.

Figure 127 DSP Multispan T1 NIC Physical Interfaces

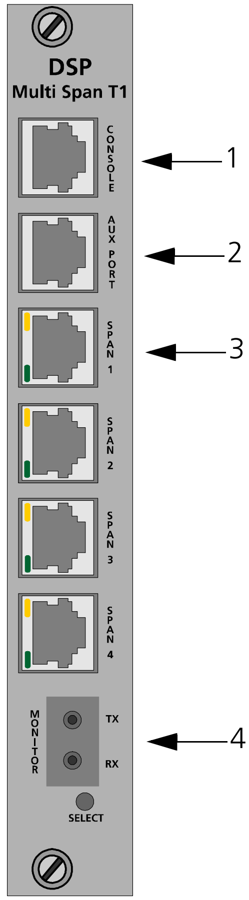


Table 28 references the callouts in Figure 127.

Table 28 DSP Multispan E1 NIC Physical Interface Description

Callout Number	Interface Description
1	Console Port: RJ-45 DTE port Connect to this port to access the DSP multispan NAC's CLI. The port is configured for 9600 baud, 8 data bits, 1 stop bit, no parity.

Table 28 DSP Multispan E1 NIC Physical Interface Description (continued)

Callout Number	Interface Description
2	AUX Port: RJ-45 DTE port Connect to this port to perform a software download to the DSP multispan NAC. The port is configured for 115200 baud, 8 data bits, 1 stop bit, and no parity.
3	Spans 1 - 4: RJ-48C T1/E1 span line 1 interface Connect a T1 or E1 span line to this port. The NIC has four span ports for T1 applications and three span ports for E1 applications.
4	Monitor: Bantam Monitoring jack Connect span line monitoring equipment to this port for span 1 diagnostics.

Depending on your specific application, connect the correct cable to the DSP multispan NIC's console port. See Figure 128 below.

Figure 128 DSP Multispan E1 NIC Cabling

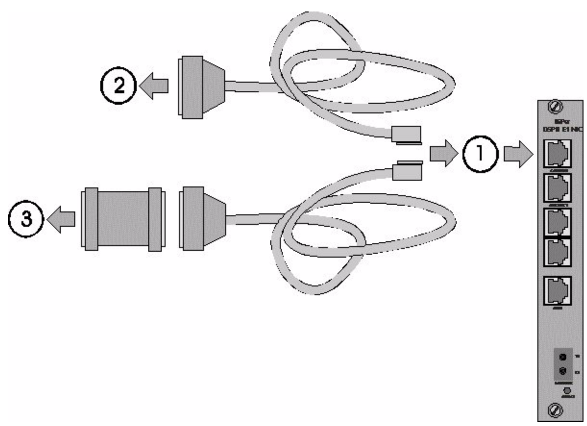


Table 29 identifies the items in Figure 128.

Table 29 DSP multispan NIC Cabling Callout Number Descriptions

Callout Number	Description
1	RJ-45 connector to NIC's console port
2	DB-25 male connector to modem for remote operations
3	DB-25 female-to-female null modem adapter to PC or terminal COM port

Installation Verification

Verify installation by observing the LEDs after installing and powering the NAC and corresponding NIC. Refer to the DSP Multispan Card Overview chapter for LED information.

Network Application Card Verification

To verify the installation of the DSP multispan NAC:

- The RN/FL LED should be solid green.
- If the RN/FL LED does not light, or is solid red or flashing red, there is an error. Refer to the Trouble Locating and Clearing appendix for more information.

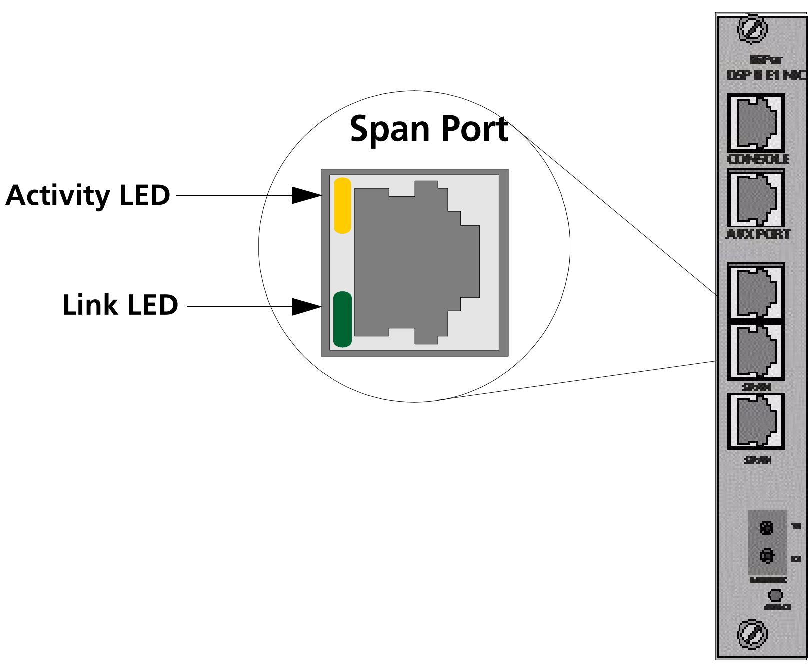
Network Interface Card Verification

For T1/E1 applications, the LEDs on the corresponding NIC should show activity:

- DSP multispan T1 NIC with four RJ-48C connectors
- DSP multispan E1 NIC with three RJ-48C connectors

The Activity LED should flash yellow-green to indicate the port is receiving and transmitting. The Link LED is a solid green to indicate a connection is established and the NIC is receiving valid link pulses. The figure below shows NIC verification for E1 applications.

Figure 129 DSP Multispan E1 NIC Status LEDs



For assistance in troubleshooting the DSP multispan card refer to Appendix A, Trouble Locating and Clearing.

DS-3 Ingress Verification

For DS-3 applications, the DS-3 ingress NAC should show activity. The RN/FL NAC and RN/FL NIC status LED indicators found on the DS-3 ingress NAC should be solid green.

Post Installation Procedures

The next steps before you can configure the DSP multispan card set is to:

- Get the necessary line information from your local phone company.
- Cable the cards for Command Line Interface connections

If you are going to use total control manager to manage your network, refer to the Total Control Manager User Guide.

Requesting Required Line Information

Before configuring your DSP multispan NAC, obtain the necessary line information from your local telephone company.

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

Table 30 Required Line Information

Information	Span variable	Typical value	Your value
Line coding	lcoding	dsx1HDB3	
Framing	ltype	CCITT Recommendation G.704	
Switch type	swtype	NET5/CTR 4 (European ISDN)	

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

Command Line Interface Cabling

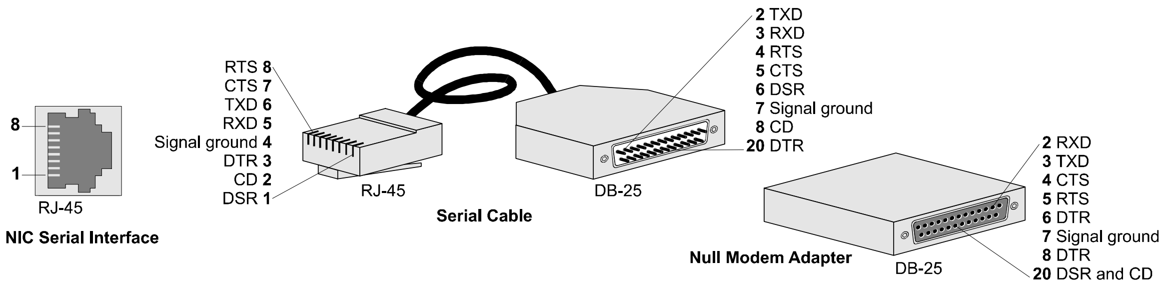
This section contains procedures for physically connecting the DSP multispan card to a local workstation running terminal emulation software to access the command line interface (CLI) menu.

You must first attach the DSP multispan card to your local workstation.

1. Connect the DB-25 (male) end of the cable shown in Figure 130 to the null modem adapter (female) that was supplied in the original packaging.
2. Connect the RJ-45 end of the cable shown in Figure 130 to the console port on the DSP multispan card NIC. The NIC is located in the rear of the Total Control 1000 chassis.

The console port is the topmost port on the NIC.

Figure 130 Serial Connection Pinouts



3 Connect the null modem adapter directly to a serial port on the computer, or to an EIA-232 cable connected to a serial port on the computer.

You are now ready to access the CLI through a terminal emulation software package. A familiar one is HyperTerminal.

13 INITIAL CONFIGURATION—CHANNELIZED T1

This chapter provides instructions for the initial configuration of the DSP multispan Network Application Card (NAC) using channelized T1 signaling.

Unless otherwise specified, all references to the DSP multispan card also apply to the HiPer DSP card.

This chapter contains the following topics:

- Configuration Options
- Accessing the Command Line Interface
- Configuring Channelized T1

Before you can begin the configuration procedures you must have the cards installed in the CommWorks Total Control 1000® chassis, have the trunk line information from your Telco company, and if you are going to use the Command Line Interface (CLI) commands, the cards must be cabled to your workstation. Refer to Installing the DSP Multispan Card Set for more information. If you are going to use a management system suchas common element manger, that also needs to be installed.

Configuration Options

Table 31 lists the different configuration options available to you.

Table 31 Configuration Options

Configuration Option	Configuration Interface
Modems and spans using MIBs	Windows 95/98, Windows NT, or UNIX Total Control Manager or SNMP and a MIB browser
Modems and spans using CLI	Windows 95/98, Windows NT, or UNIX CLI in conjunction with your preferred terminal program (e.g., HyperTerminal)

CommWorks recommends using common element manager to configure, save, and monitor most settings of the Total Control® 1000 modem cards. Use the CLI when directed.

Accessing the Command Line Interface

This section contains procedures for running terminal emulation software to access the command line interface (CLI) menu locally. For information on configuring the DSP multispan card remotely, refer to the *Modem and Span Command Line Interface Reference*.

If you are not going to use the CLI you can proceed to the next step.

Before running a terminal emulation software program, the DSP multispan card must be cabled to your local workstation. Refer to Installing the DSP Multispan Card Set for more information.

Accessing the Terminal Emulation Software

After you have the cables connected, the next step is to run a terminal emulation software package. A familiar one is HyperTerminal.

1. Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.
2. Configure the communications application to use the COM port where the serial cable is connected.

   Table 32 lists the configuration settings.

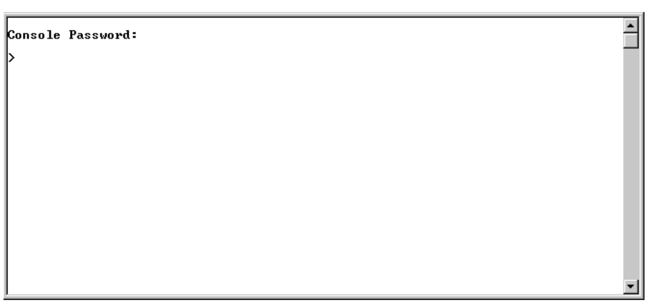
   Table 32 DSP Multispan Console Port Configuration Settings

Setting	Variable
Port speed	9600 bps (default)
Terminal type	VT100
Data bits	8
Parity	None
Stop bits	1
Flow control	None

3. At the terminal screen, type in your login and password.

   After you log in the DSP multispan card's CLI **root command prompt** displays.

Figure 131 DSP Multispan CLI Login



Configuring Channelized T1

Use the following procedures to configure the DSP multispan NAC for a traditional channelized T1 service.

Requesting Required Line Information

Before configuring your DSP multispan NAC, obtain the necessary line information from your local telephone company.

Required Line Information

When you order your telephone company interface or PSTN interface, obtain the necessary line information from your telephone company. Record your line information in Table 33 for future reference.

Table 33 Required Line Information

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

Optional Line Information

If you have requested additional Dialed Number Identification Service (DNIS) or Automated Number Identification (ANI) service, the information in Table 34 should also be available:

Table 34 Optional Line Information

Optional Line Type	Number of digits (supplied by telephone company)
ANI digits	
DNIS digits	

Initial Configuration Procedure

Use the following sets of procedures to configure the DSP multispan. These procedures are intended for initial configuration only. Refer to the *Total Control 1000 Modem and Terminal Adapters Features Guide* and *Total Control1000 Span Features Guide* for more information.

Viewing Line Settings

Before you begin configuring the DSP multispan card, you need to view the current settings to determine if you need to make any adjustments. You can view these settings using common element manager or CLI.

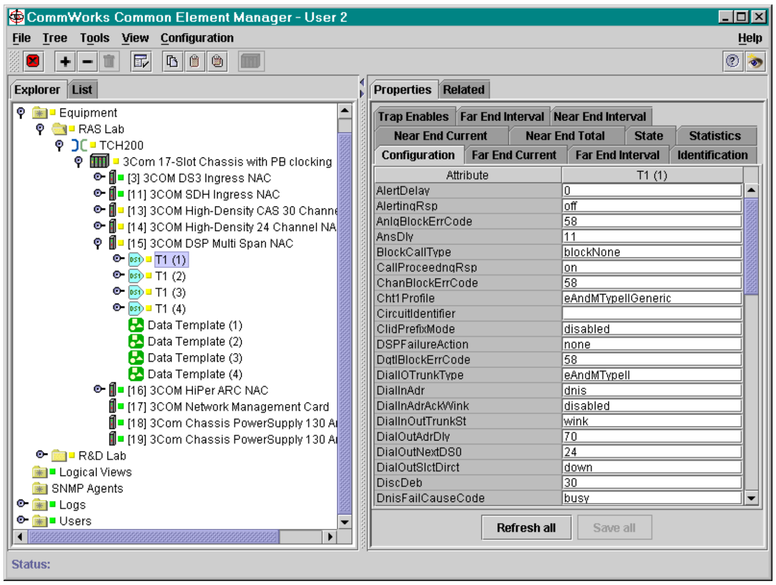
Common Element Manager

To view T1 span settings using the common element manager:

1. Click the T1 span to be viewed on the DSP multispan NAC.
2. Click the **Configuration** tab.

   The **T1 Configuration** window displays showing the current span settings.

Figure 132 Viewing the T1 Span Settings



Other parameters may appear in the common element manager window that do not pertain to T1.

Command Line Interface

To view the current network line settings using the CLI:

1. Access the configuration interface through the CLI.
2. Select the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

   span1> **chdev spanx**

3. View the line current lines setting for the selected span level. Type:

   span1> **display ccrcfig**

Figure 133 Sample Span level Configuration Display

```
chdev span
span1> display ccrcfig
  Span1 Configured Signal Mode is (sigmode): MESSAGE ORIENTED
  Span1 Signal Mode Active is:               MESSAGE ORIENTED
  Span1 Configured Switch Type is (swtype):  5ESS
  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
  Span1 Alert Message Mode (alrtmsg):        ALRT MSG MODE DISABLED
  Span1 CALL PROC Message Mode (cprocmsg):   CALLPROC MSG MODE ENABLED
  Span1 Signaling Group Type is:             FAS
  Span1 DNIS Auth. Failure Cause Code is:    USER BUSY

span1>
```

Selecting T1 Line Signaling

The line signaling for a channelized T1 must be set to robbed bit. You can change the signaling using either the common element manger or CLI.

Common Element Manager

To change the signaling using the common element manager:

1 Click the T1 span to be configured on the DSP multispan NAC.

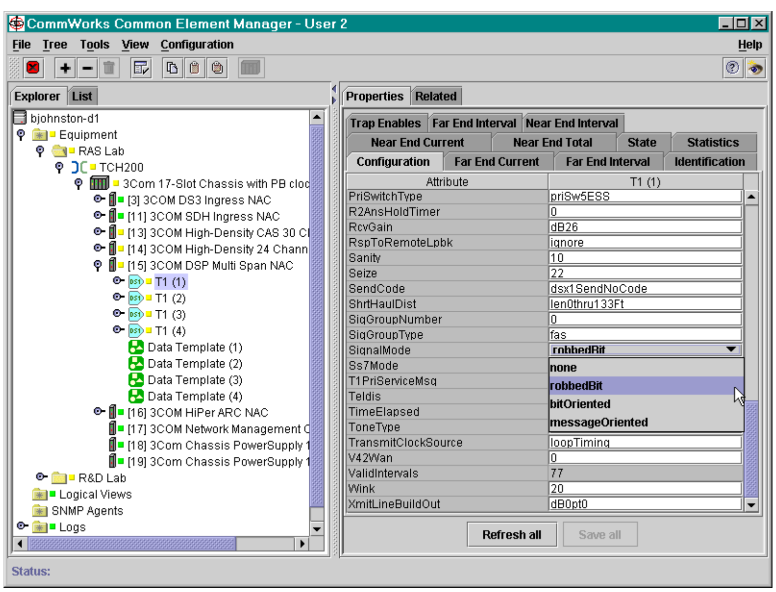
You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **SignalMode** field on the Configuration tab.

The SignalMode configuration drop-down list appears.

Figure 134 RobbedBit Configuration Window



4 Select **robbedBit**.

5 Click **Save All**.

Command Line Interface

To select the correct T1 line signaling mode using CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

2 Select robbed-bit signaling. This is the popular signaling mechanism for traditional T1 trunk lines.

3 Type:

```
span1> set sigmode robbit
```

If you change the signaling mode of the DSP multispan NAC, save the settings and reboot the DSP multispan NAC for this change to take effect. Either manually reboot the card by pulling it out and reinserting it, or from the root directory of the CLI, enter ***reboot****.*

The sigmode command effects all of the spans on the card.

Configuring the Feature Group

E&M, generic profile is the default DSP multispan Feature Group. If the Feature Group supplied by your telephone company is not E&M, generic profile, you need to configure the feature group. You can configure the feature group using either common element manager or CLI.

Common Element Manager

To change the feature group using the common element manager:

1 Click the T1 span to be configured on the DSP multispan NAC.

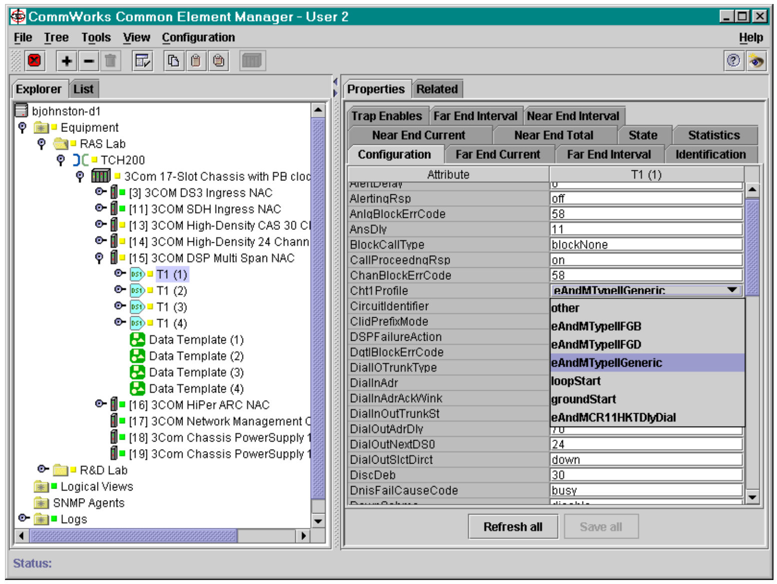
You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **cht1Profile** field on the Configuration tab.

The feature group configuration drop-down list appears.

Figure 135 Feature Group Configuration Window



4 Select the needed feature group from the drop-down list.

5 Click **Save All**.

Command Line Interface

To select the feature group using CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

Enter the command matching the feature group listed in Table 35.

Table 35 Feature Group Profiles

Feature Group	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

Configuring for DNIS and ANI

You can use either common element manger or CLI to configure the DSP multispan NAC for these services.

Common Element Manager

To change the DNIS and ANI using the common element manager:

1 Click the T1 span to be configured on the DSP multispan NAC.

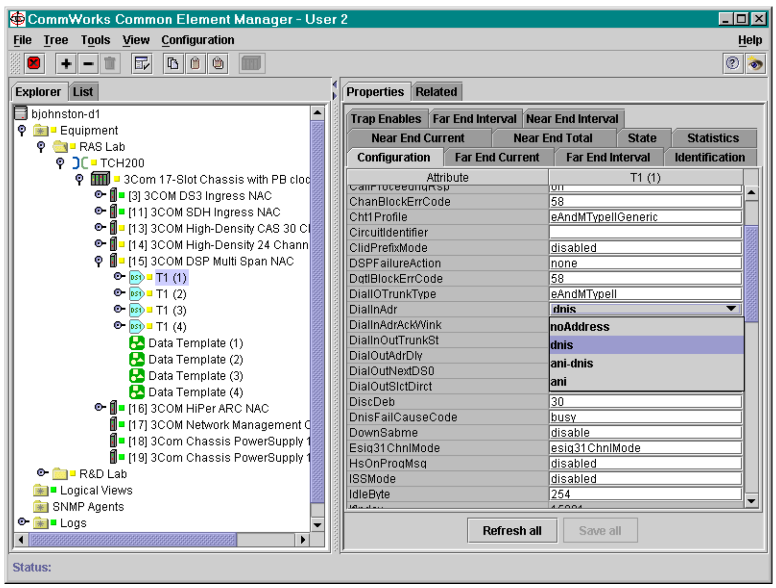
You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **DialInAdr** field on the Configuration tab.

The DNIS and ANI configuration drop-down list appears.

Figure 136 DNIS and ANI Configuration Window



4 Select the needed DNIS or ANI group from the drop-down list.

5 Click **Save All**.

Command Line Interface

To select the DNIS or ANI group using CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

1 Configure the DNIS on the span line.

Table 36 lists the appropriate commands.

Table 36 DNIS Commands

DNIS Configuration Option	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

Configuring the Tone Type

You can set the type of tone using either common element manager or the CLI.

Common Element Manager

To change the type of tone using the common element manager:

1 Click the T1 span to be configured on the DSP multispan NAC.

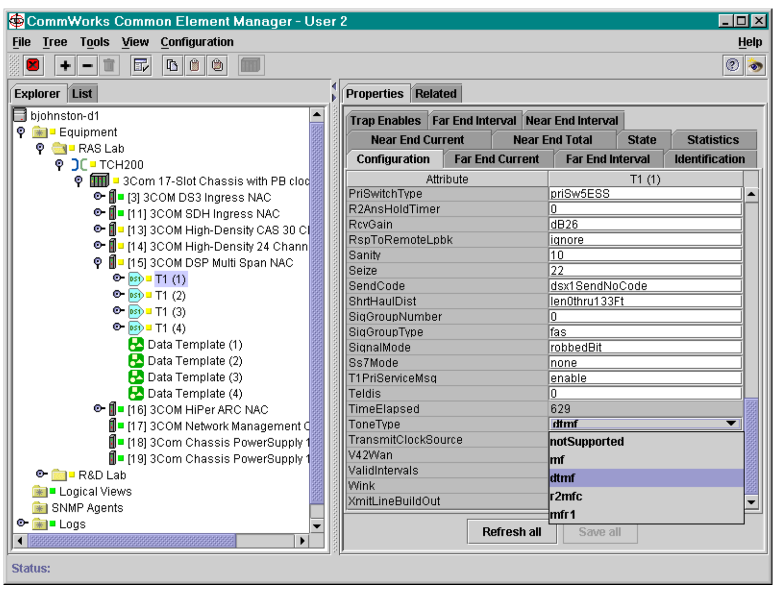
You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **ToneType** field on the Configuration tab.

The tone type configuration drop-down list appears.

Figure 137 Tone Type Configuration Window



4 Select the needed tone from the drop-down list.

5 Click **Save All**.

Command Line Interface

To select the feature group using CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

Enter the command matching the tone type listed in Table 37.

Table 37 Tone Commands

Tone Type	Command
DTMF tones	set tonetype dtmftone
MF tones	set tonetype mftone

The tones must be set to DTMF if the requirements are to dial-out.

2 If your lines support DTMF tones, set the number of DTMF tones supported (0-127). If using the CLI, type:

```
span1> set numdtmft 4
```

The number of DTMF tones must equal the number of the ANI plus DNIS digits received.

Configuring Acknowledgement Wink

You can use either common element manger or CLI to configure the DSP multispan NAC for these services.

Common Element Manager

To change the acknowledgement wink using the common element manager:

1 Click the T1 span to be configured on the DSP multispan NAC.

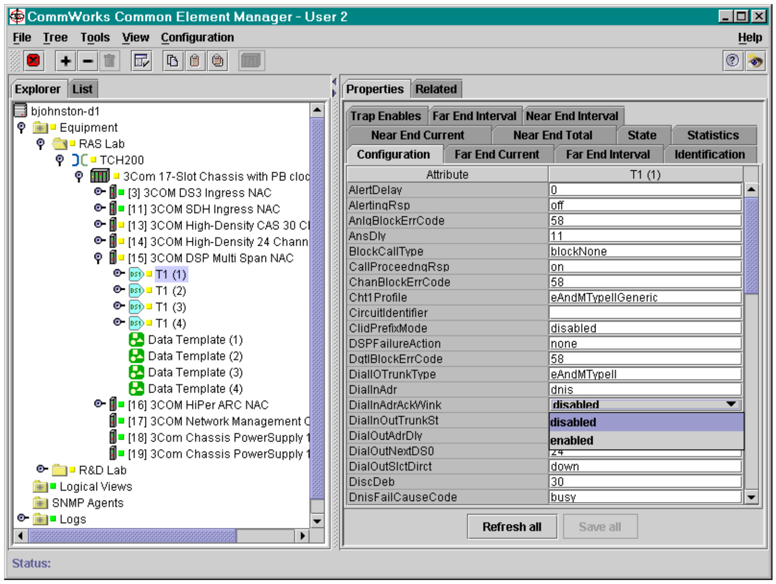
You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **DialInAdrAckWink** field on the Configuration tab.

The wink configuration drop-down list appears.

Figure 138 Wink Configuration Window



4 Select the needed wink acknowledgement field from the drop-down list.

5 Click **Save All**.

Command Line Interface

To select the wink acknowledgement using CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

`span1>` **`chdev spanx`**

2 Set the acknowledgment wink.

Table 38 lists the appropriate commands.

Table 38 Wink Commands

Wink Function	Command
Enable acknowledgment wink after the dial in address	set daackwnk enable
Disable acknowledgment wink after the dial in address	set daackwnk disable

This step is required only to enable wink start circuit setting.

Verifying the Settings

You can verify the settings you just modified using either common element manager or CLI.

Common Element Manager

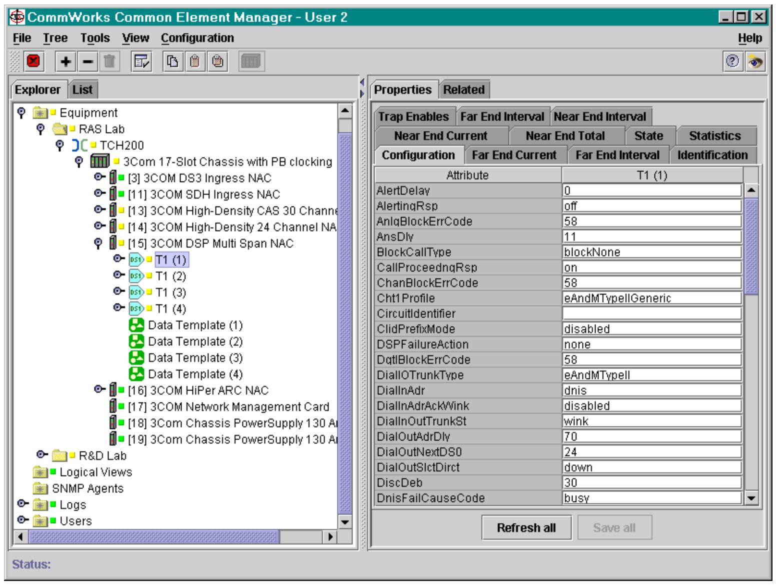
To view T1 span settings using the common element manager:

1 Click the T1 span to be viewed on the DSP multispan NAC.

2 Click the **Configuration** tab.

The **T1 Configuration** window displays showing the current span settings.

Figure 139 Viewing the T1 Span Settings



Command Line Interface

You can view the settings you just modified by selecting the appropriate commands listed in Table 39.

Table 39 Setting Commands

Setting Type	Command
Line signaling	display sigmode
DNIS settings	display dnisena
Tone type	display tonetype
Channelized T1 profile	display cprofile

Configuring Line Type and Line Coding

If you selected Feature Group B or D, you have automatically configured the DSP multispan NAC 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.

You can configure these two options using either common element manager or CLI.

Common Element Manager

To change the line coding and the line type using the common element manager:

1 Click the T1 span to be configured on the DSP multispan NAC.

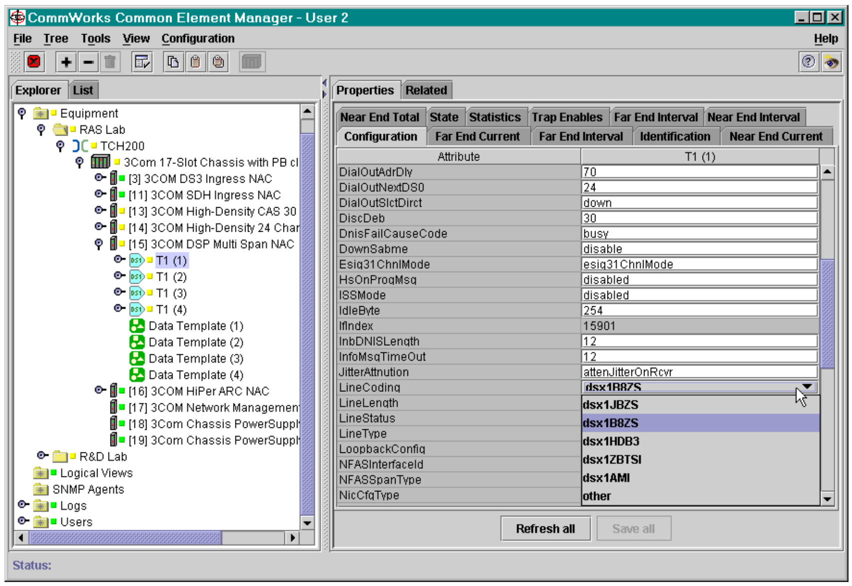
You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **lcoding** field on the Configuration tab.

The lcoding configuration drop-down list appears.

Figure 140 Line Coding Configuration Window



4 Select the needed line coding from the drop-down list.

5 Double-click the **ltype** field on the Configuration tab.

6 Select the need line type from the drop-down list.

7 Click **Save All**.

Command Line Interface

1 View your line coding by entering the following command:

```
span1> display lcoding
```

2 If the DSP multispan NAC line coding does not match your settings, change your line coding method.

Table 40 lists the appropriate commands.

Table 40 Line Coding Commands

Line Coding Method	Command
Binary Eight Zero Code Suppression	set lcoding b8zs
Alternate Mark Inversion	set lcoding ami

3 View your line type by entering the following command:

```
span1> display ltype
```

4 If the DSP multispan NAC line type does not match your settings, change your line type.

Table 41 lists the appropriate commands.

Table 41 DS1 Line Types

DS1 Line Type	Command
Extended SuperFrame DS1	set ltype esf
AT&T D4 format DS1	set ltype d4

Saving the Configuration

When you finish configuring the DSP multispan, save the span and modem settings using either the common element manager or the CLI. For more information on saving configurations, refer to the *Operations Guide*.

Common Element Manager

To save the new configurations using common element manager:

1 Click **Save all** on the Configuration tab window.

2 Right-click the DSP multispan card.

3 Select **Save to NVRAM** on the Configuration pop-up list.

4 Right-click the chassis.

5 Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

Command Line Interface

To save the new configurations using CLI:

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

```
span1> cmd svspcfg
```

2 Select the modem you want to configure. Configure modems 1 through 96. If a modem number is not selected, the system will default to modem 1.

For example:

```
span1> chdev mdm 25
```

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

```
at&w
```

For example:

```
mdm 25> at&w
```

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

```
> reboot
```

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

Testing the Configuration

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

2 Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

3 Change to the timeslot level. Type the following command, and replace “x” with the desired time slot:

```
span1> chdev tslotx
```

4 Display timeslot and modem status.

```
span1/tslot1> display atstat
```

Look for your incoming call to be displayed in the *Connect In* column of the CLI.

14 Initial Configuration—T1 Primary Rate Interface

This chapter provides instructions for the initial configuration of the DSP multispan Network Application Card (NAC) using T1 PRI signaling.

The common element management screens and the command line interface screens are very similar to those for the channelized T1 DSP multispan card. They have not been reproduced here. Refer to Initial Configuration—Channelized T1 to view the screens.

Unless otherwise specified, all references to the DSP multispan card also apply to the HiPer DSP card.

This chapter contains the following topics:

- Configuration Options
- Accessing the Command Line Interface
- Configuring Primary Rate Interface

Before you can begin the configuration procedures you must have the cards installed in the Total Control 1000 chassis, have the trunk line information from your Telco company, and if you are going to use the CLI commands, the cards must be cabled to your workstation. Refer to Installing the DSP Multispan Card Set for more information. If you are going to use a management system such as common element manger, that also needs to be installed.

Configuration Options

Table 42 lists the different configuration options available to you.

Table 42 Configuration Options

Configuration Option	Configuration Interface
Modems and spans using MIBs	Windows 95/98, Windows NT, or UNIX
	Total Control Manager or SNMP and a MIB browser
Modems and spans using the CLI	Windows 95/98, Windows NT, or UNIX
	CLI in conjunction with your preferred terminal program (e.g., HyperTerminal)

CommWorks recommends using common element manager to configure, save, and monitor most settings of the Total Control® 1000 modem cards. Use the CLI when directed.

Accessing the Command Line Interface

This section contains procedures for running terminal emulation software to access the command line interface (CLI) menu locally. For information on configuring the DSP multispan card remotely, refer to the *Modem and Span Command Line Interface Reference*.

If you are not going to use the CLI you can proceed to the next step.

Before running a terminal emulation software program, the DSP multispan card must be cabled to your local workstation. Refer to Installing the DSP Multispan Card Set for more information.

Accessing the Terminal Emulation Software

After you have the cables connected, the next step is to run a terminal emulation software package. A familiar one is HyperTerminal.

1. Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.
2. Configure the communications application to use the COM port where the serial cable is connected.

   Table 43 lists the console port settings:

   Table 43 Console Port Serial Communication Settings

Setting	Variable
Port speed	9600 bps (default)
Terminal type	VT100
Data bits	8
Parity	None
Stop bits	1
Flow control	None

3. At the terminal screen, type in your login and password.

After you log in the access router card's CLI **root command prompt** displays.

Figure 141 DSP Multispan CLI Login

Configuring Primary Rate Interface

Use the following procedures to configure the DSP multispan NAC for T1/Primary Rate Interface (PRI) services.

Requesting Required Line Information

Before configuring your DSP multispan NAC, obtain the necessary line information from your local telephone company.

Required Line Information

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

Table 44 Required Line Information

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.

NFAS Applications

To increase the number of B-channels when using multiple T1/PRI lines with the Total Control 1000 Hub, you can configure the DSP multispan NAC for Non-Facility Associated Signaling (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 increase available resources, i.e., modems.

To increase signaling reliability with NFAS, designate a backup D-channel. This means that each NFAS group could have two D-channels, one active and one standby.

Selecting the spans

Determine the number and type of spans 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 requesting switch connection and span line information from your telephone company:

- No more than 14 spans per group (due to the maximum number of DSP multispan NACs in a chassis)
- At least two spans per group with no backup D-channel
- At least three spans per group with a backup D-channel
- One and only one primary D-channel per group
- One optional backup D-channel per group
- No interoperability with Dual T1/PRI NAC
- An NMC must be present in the chassis and operating normally (i.e., Chassis awareness information available)
- NFAS is supported with any gateway card (i.e., NetServer, Access Router Card, EdgeServer™)

Requesting NFAS services

To activate NFAS services, request your telephone company to provide a compatible switch and to issue the number and type of spans that you want in each NFAS group.

The telephone company will assign the fixed interface IDs for each of those spans. You will later use those interface IDs to configure the DSP multispan.

The telephone company must assign interface IDs from 0-13. The DSP multispan NAC does not support any other interface ID numbers.

Initial Configuration Procedure

Use the following sets of procedures to configure the DSP multispan. These procedures are intended for initial configuration only.

Common Element Manager

To view T1/PRI span settings using the common element manager:

1. Click the T1/PRI span to be viewed on the DSP multispan NAC.
2. Click the **Configuration** tab.

   The **T1/PRI Configuration** window displays showing the current span settings.

Command Line Interface

To view the current network line settings using the CLI:

1. Access the configuration interface through the CLI.
2. Select the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3, 4):

   ```
   span1> chdev spanx
   ```

3. View the line current lines setting for the selected span level. Type:

   ```
   span1> display ccrcfig
   ```

Selecting T1/PRI Line Signaling

The line signaling for a channelized T1 must be set to robbed bit. You can change the signaling using either the common element manger or CLI.

Common Element Manager

To change the signaling using the common element manager:

1. Click the T1/PRI span to be configured on the DSP multispan NAC.

   You can click more than one span by pressing the Control key while clicking.

2. Click the **Configuration** tab.
3. Double-click the **SignalMode** field on the Configuration tab.

   The SignalMode configuration drop-down list appears.

4. Select **messageOriented**.
5. Click **Save All**.

Command Line Interface

To select the correct T1/PRI line signaling mode using CLI:

1. Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3, 4):

   ```
   span1> chdev spanx
   ```

2. Select robbed-bit signaling. This is the popular signaling mechanism for traditional T1/PRI trunk lines.

3 Type:

```
span1> set sigmode msgorien
```

If you change the signaling mode of the DSP multispan NAC, save the settings and reboot the DSP multispan NAC for this change to take effect. Either manually reboot the card by pulling it out and reinserting it, or from the root directory of the CLI, enter ***reboot****.*

The sigmode command effects all of the spans on the card.

Selecting the Switch Type

You can change the switch type using either the common element manger or CLI.

Common Element Manager

To change the type of switch using the common element manager:

1 Click the T1/PRI span to be configured on the DSP multispan NAC.

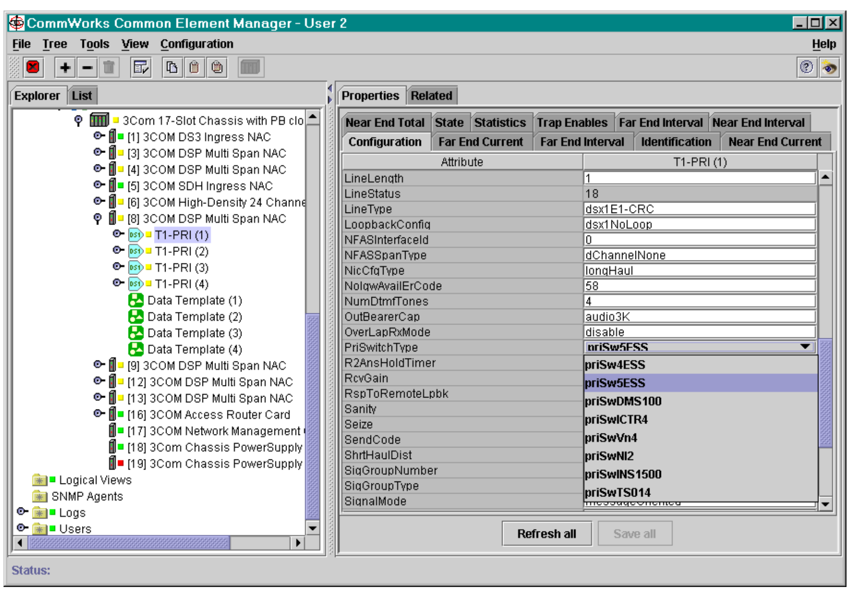
You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **PriSwitchType** field on the Configuration tab.

The switch type configuration drop-down list appears.

Figure 142 Switch Type Configuration Window



4 Select the type of switch for your environment from the drop-down list.

5 Click **Save All**.

Command Line Interface

To select the type of switch for your environment using CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

Use Table 45 to set the PRI switch type.

Table 45 PRI Switch Types

PRI Switch Type	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

Selecting the Framing Type

You can change the framing type using either the common element manger or CLI.

Common Element Manager

To change the type of framing using the common element manager:

1 Click the T1/PRI span to be configured on the DSP multispan NAC.

You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **LineType** field on the Configuration tab.

The line type configuration drop-down list appears.

4 Select the type of frame for your environment from the drop-down list.

5 Click **Save All**.

Command Line Interface

To select the type of frame for your environment using CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

2 Enter the CLI command to set the frame type.

Table 46 lists the CLI commands to set the frame type.

Table 46 DS1 Frame Types

DS1 Frame Type	Command
Extended SuperFrame DS1 (T1/PRI)	set ltype esf
AT&T D4 format DS1 or Super Frame (T1/PRI)	set ltype d4

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

Configuring for Short-Haul or Long-Haul

You can configure the short and long haul types using common element manager or CLI.

Common Element Manager

To change the type of haul using the common element manager:

1. Click the T1/PRI span to be configured on the DSP multispan NAC.

   You can click more than one span by pressing the Control key while clicking.
2. Click the **Configuration** tab.
3. Double-click the **NicCfgType** field on the Configuration tab.

   The long and short haul configuration drop-down list appears.
4. Make your selection for your environment from the drop-down list.
5. Click **Save All**.

Command Line Interface

To configure the DSP multispan for the long-haul or short-haul NIC using CLI:

1. Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3, 4):

   ```
   span1> chdev spanx
   ```
2. Enter the CLI command to set the long-haul or short-haul for the NIC.

   Table 47 lists the CLI commands to set the long-haul or short-haul NIC.

   Table 47 DSP multispan Long-Haul / Short-Haul NIC Types

NIC Type	Command
Long-haul	set nicfgtyp long
Short-haul	set nicfgtyp short
3. If you are using a short-haul NIC, set the signal level distance.

Table 48 lists the common element manager field on the Configuration tab and CLI commands to set the signal level distance.

Table 48 Short-Haul NIC Signal Level Distance

Signal Level Distance	Common Element Manager Field	CLI Command
0 to 200 meters	LineLength	set ds1linelength <0 to 200>

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

Table 49 lists the common element manager field on the Configuration tab and CLI commands to set the transmit line build out signaling.

Table 49 Long-Hault NIC Transmit Line Build Outs

Transmit Line Build Out	Common Element Manager Field	Command
0.0 db xmit [dB0]	XmitLineBuldOut	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. Set the transmit line build out according to the instructions given by your telephone company. Remember the more decibels you use, the greater the possibility for crosstalk; and, the fewer decibels you use, the greater the possibility for attenuation.

Verifying the Settings

You can verify the settings you just modified using either common element manager or CLI.

Common Element Manager

To view T1/PRI span settings using the common element manager:

1 Click the T1/PRI span to be viewed on the DSP multispan NAC.

2 Click the **Configuration** tab.

The **T1/PRI Configuration** window displays showing the current span settings.

Command Line Interface

You can view the settings you just modified by selecting the appropriate commands listed in Table 50.

If necessary, view the settings you just modified.

Table 50 Setting Types

Setting Type	Command
Line signaling	display sigmode
Switch type	display swtype
Line type	display ltype

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

NFAS Configuration

Use the following sets of procedures to configure the DSP multispan NAC for NFAS services. These procedures are intended for initial configuration only. Refer to the *Modem and Span Command Line Reference* for more information.

You can configure NFAS using either the common element manager or CLI.

Common Element Manager

To change the type of switch using the common element manager:

1. Click the T1/PRI span to be configured on the DSP multispan NAC.

   You can click more than one span by pressing the Control key while clicking.
2. Click the **Configuration** tab.
3. Double-click the **PriSwitchType** field on the Configuration tab.

   The T1/PRI switch type configuration drop-down list appears.
4. Make your selection for your environment from the drop-down list.
5. Double-click the **NFASInterfaceId** field on the Configuration tab.
6. Make your selection for your environment from the drop-down list.
7. Double-click the **NFASSpanType** field on the Configuration tab.
8. Make your selection for your environment from the drop-down list.
9. Double-click the **SigGroupType** field on the Configuration tab.
10. Make your selection for your environment from the drop-down list.
11. Click **Save All**.

Command Line Interface

To configure the DSP multispan for the type of switch using CLI:

1. Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3, 4):

   ```
   span1> chdev spanx
   ```
2. Display the current NFAS configuration by entering the following command:

   ```
   span1> display nfas
   ```

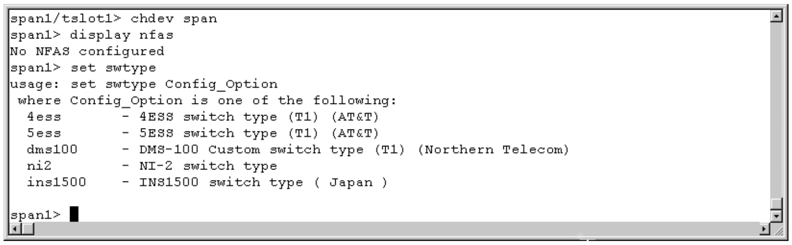
   If the card is configured, the *NFAS All Groups Info Table* appears. To configure or reconfigure the card, continue with these steps.

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

span1> **set swtype**

Figure 143 displays the result of the swtype command.

Figure 143 DSP Multispan Switch Types



```
span1/tslot1> chdev span
span1> display nfas
No NFAS configured
span1> set swtype
usage: set swtype Config_Option
 where Config_Option is one of the following:
  4ess        - 4ESS switch type (T1) (AT&T)
  5ess        - 5ESS switch type (T1) (AT&T)
  dms100      - DMS-100 Custom switch type (T1) (Northern Telecom)
  ni2         - NI-2 switch type
  ins1500     - INS1500 switch type ( Japan )

span1>
```

4 Enter a command from Table 51 to set the switch type.

Use Table 51 to reference the PRI switch type.

Table 51 PRI Switch Types

PRI Switch Type	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

5 Set the switch type by entering the following command:

span1> **set switch [switch type]**

If the configuration is successful, *Configuration Request Successful* appears. Also verify you set the switch type. Enter:

span1> **display swty**

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

span1> **reboot**

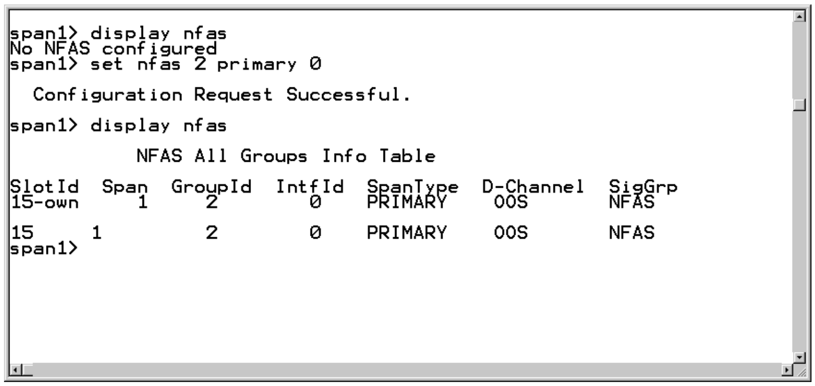
You must reboot the card to save the switch-type setting.

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

`span1>` **`display nfas`**

Figure 144 displays the result of the NFAS command when NFAS is configured.

Figure 144 DSP MUltispan Sample NFAS Configuration



```
span1> display nfas
No NFAS configured
span1> set nfas 2 primary 0

  Configuration Request Successful.

span1> display nfas

           NFAS All Groups Info Table

SlotId  Span  GroupId  IntfId  SpanType  D-Channel  SigGrp
15-own     1        2       0  PRIMARY    OOS       NFAS

15       1         2        0  PRIMARY    OOS       NFAS
span1>
```

Table 52 lists the definitions for the above NFAS display.

Table 52 NFAS Syntax Definitions

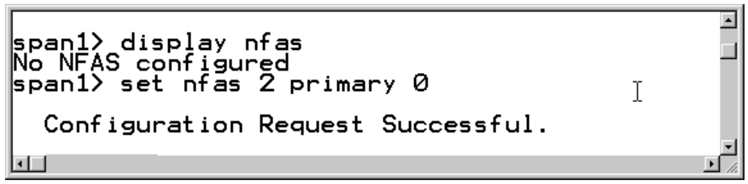
Syntax	**Definitions**
Slot Id	The card's chassis slot
Group Id	The card's NFAS group ID
IntfId	The line interface ID, which Telco assigns
SpanType	Either primary, backup, or no D-channel on the span
D-Channel	The following are descriptions of card's D-channel: IS: In Service STBY: STand BY OOS: Out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

8 Using the NFAS 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 DSP multispan. The telephone company must issue interface IDs from 0-13.

Figure 145 is an example of possible NFAS configuration syntax.

Figure 145 DSP Multispan T1 PRI Sample NFAS Configuration Screen



If you correctly configured the span to have a primary D-channel, the LPBK/D-ALM LED, on the face of the DSP multispan, 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.

9 Confirm your configuration by entering the following syntax:

`span1>` **`display nfas`**

An NFAS groups table appears.

When you finish configuring DSP multispan, save the span and the modem configurations.

10 Save the span configuration. Enter:

`span1>` **`cmd svspcfg`**

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 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

`span1>` **`chdev spanx`**

4 View the status of the card by entering the following:

`span1>` **`display nfas`**

The *NFAS All Groups Info Table* appears. Refer to Figure 144 for an example of the NFAS All Group Info Table.

5 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—the card senses the primary D-channel is down.
- IS—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—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*.

Saving the Configuration

When you finish configuring the DSP multispan, save the span and modem settings using either the common element manager or the CLI. For more information on saving configurations, refer to the *Operations Guide*.

Common Element Manager

To save the new configurations using common element manager:

1. Click **Save all** on the Configuration tab window.
2. Right-click the DSP multispan card.
3. Select **Save to NVRAM** on the Configuration pop-up list.
4. Right-click the chassis.
5. Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

Command Line Interface

To save the new configurations using CLI:

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

   ```
   span1> cmd svspcfg
   ```

2. Select the modem you want to configure. Configure modems 1 through 96. If a modem number is not selected, the system will default to modem 1.

   For example:

   ```
   span1> chdev mdm 25
   ```

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

   ```
   at&w
   ```

   For example:

   ```
   mdm 25> at&w
   ```

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

```
> reboot
```

Testing the Modems Because the modems receive calls in a sequential order, your initial setup does 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 appears red.

3 Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3, 4):

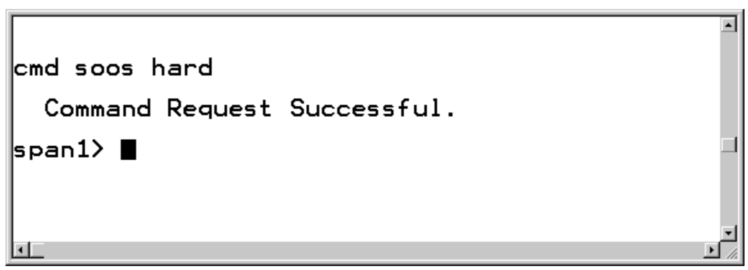
```
span1> chdev spanx
```

4 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
```

Figure 146 displays the sequence of deactivating a modem.

Figure 146 DSP Multispan T1 PRI Deactivating a Modem



5 To verify you de-activated those modems, enter:

```
span1> display atp
```

A screen similar to Figure 147 displays, listing the DSP multispan modem status. In the status column, each modem should display *OOS*, indicating that the modem is Out Of Service.

Figure 147 DSP Multispan T1 PRI Taking a Modem OOS

```
span1> display atp

Tslot  Status   Modem    Span    Protocol
               Connect  Status
 01      OOS     N/A     Alarm   N/A
 02      OOS     N/A     Alarm   N/A
 03      OOS     N/A     Alarm   N/A
 04      OOS     N/A     Alarm   N/A
 05      OOS     N/A     Alarm   N/A
 06      OOS     N/A     Alarm   N/A
 07      OOS     N/A     Alarm   N/A
 08      OOS     N/A     Alarm   N/A
 09      OOS     N/A     Alarm   N/A
 10      OOS     N/A     Alarm   N/A
 11      OOS     N/A     Alarm   N/A
 12      OOS     N/A     Alarm   N/A
 13      OOS     N/A     Alarm   N/A
 14      OOS     N/A     Alarm   N/A
 15      OOS     N/A     Alarm   N/A
 16      OOS     N/A     Alarm   N/A
 17      OOS     N/A     Alarm   N/A
 18      OOS     N/A     Alarm   N/A
 19      OOS     N/A     Alarm   N/A
 20      OOS     N/A     Alarm   N/A
 21      OOS     N/A     Alarm   N/A
 22      OOS     N/A     Alarm   N/A
 23      OOS     N/A     Alarm   N/A
 24     Dchan    N/A     Alarm   N/A

span1>
```

6 Dial the line number of your NFAS group. The first modem LED on the *second* card should turn green.

7 Repeat that process until you have connected to the cards in your NFAS group and tested the D-channel with each card.

8 After you test the cards, you need to reactivate the modems. Connect to the console port of each card, containing the modems you de-activated, and type the following from the *span* command line prompt:

span1> **cmd sins**

Figure 148 displays the sequence of re-activating a modem.

Figure 148 DSP Multispan T1 PRI Re-activating a Modem

```
span1> cmd sins

  Command Request Successful.

span1>
```

9 To verify you re-activated the modems, enter the following command while connected to each card:

```
span1> display atp
```

Again a table appears, and in the status column you should see *IS*, indicating that the modems are In Service.

Testing the Configuration

After you have configured your DSP multispan T1/PRI card to meet your environment's requirements you will need to test the configuration. You can test this using either the common element manger or the CLI.

Common Element Manager

To test the new configurations using CLI:

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

2 Right-click the T1/PRI span on the DSP multispan NAC.

3 Select **Monitor State** from the drop-down list.

The Monitor State window appears.

4 Select the State and Class from the drop-down lists that you want to monitor for a real time display.

Command Line Interface

To test the new configurations using CLI:

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

2 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

3 Change to the timeslot. Type the following command, and replace "x" with the desired time slot:

```
span1> chdev tslotx
```

4 Display timeslot and modem status.

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

Figure 149 displays the result of the atstat command.

Figure 149 Sample Timeslot and Modem Configuration Display

```
chdev span
span1> chdev tslot
span1/tslot1> display atstat

Tslot  Status   Modem    Status        Call ID        Action    Q931          Span
               Connect Srvc State                     Queued    Ref           Status
 01       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 02       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 03       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 04       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 05       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 06       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 07       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 08       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 09       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 10       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 11       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 12       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 13       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 14       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 15       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 16       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 17       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 18       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 19       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 20       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 21       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 22       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 23       OOS     N/A  REMOTE OOS     0x00000000       NONE    0x00000000    Alarm
 24     Dchan     N/A          IS     0x00000000       NONE    0x00000000    Alarm

span1/tslot1>
```

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

15 INITIAL CONFIGURATION—CHANNELISED E1 (R2)

This chapter provides instructions for the initial configuration of the DSP multispan Network Application Card (NAC) using channelized E1 signaling.

Unless otherwise specified, all references to the DSP multispan card also apply to the HiPer DSP card.

This chapter contains the following topics:

- Configuration Options
- Accessing the Command Line Interface
- Configuring E1/R2 Signaling

Before you can begin the configuration procedures you must have the cards installed in the Total Control 1000 chassis, have the trunk line information from your Telco company, and if you are going to use the Command Line Interface (CLI) commands, the cards must be cabled to your workstation. Refer to Installing the DSP Multispan Card Set for more information. If you are going to use a management system such as common element manager, that also needs to be installed.

Configuration Options

Table 53 lists the different configuration options available to you.

Table 53 Configuration Options

Configuration Option	Configuration Interface
Modems and spans using MIBs	Windows 95/98, Windows NT, or UNIX
	Total Control Manager or SNMP and a MIB browser
Modems and spans using a CLI	Windows 95/98, Windows NT, or UNIX
	CLI in conjunction with your preferred terminal program (e.g., HyperTerminal)

CommWorks recommends using common element manager to configure, save, and monitor most settings of the Total Control® 1000 modem cards. Use the CLI when directed.

MIB configuration is not discussed in this guide.

Accessing the Command Line Interface

This section contains procedures for running terminal emulation software to access the command line interface (CLI) menu locally. For information on configuring the DSP multispan card remotely, refer to the *Modem and Span Command Line Interface Reference*.

If you are not going to use the CLI you can proceed to the next step.

Before running a terminal emulation software program, the DSP multispan card must be cabled to your local workstation. Refer to Installing the DSP Multispan Card Set for more information.

Accessing the Terminal Emulation Software

After you have the cables connected, the next step is to run a terminal emulation software package. A familiar one is HyperTerminal.

1. Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.
2. Configure the communications application to use the COM port where the serial cable is connected.

   Table 54 lists the configuration settings.

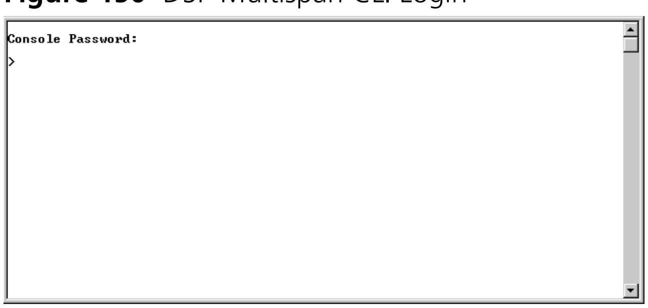
   Table 54 DSP Multispan Console Port Configuration Settings

Setting	Variable
Port speed	9600 bps (default)
Terminal type	VT100
Data bits	8
Parity	None
Stop bits	1
Flow control	None

3. At the terminal screen, type in your login and password.

   After you log in the DSP multispan card's CLI **root command prompt** displays.

Figure 150 DSP Multispan CLI Login



Requesting Required Line Information

Before configuring your DSP multispan NAC, obtain the necessary line information from your local telephone company.

Required Line Information

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

Table 55 Required Line Information

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

DSP multispan NAC E1/CAS supports only the default bit-oriented signal mode.

Use the following sets of procedures to configure the DSP multispan NAC. These procedures are intended for initial configuration only. Refer to the *Modem and Span Command Line Reference* for more information.

Configuring E1/R2 Signaling

Use the following procedures to configure the DSP multispan NAC for the E1 R2 signalling.

Viewing E1/R2 Signaling Settings

The following sections provide procedures on viewing the E1 - R2 span settings.

You can view the E1 span settings using either the common element manager, or the CLI.

If you change any settings on the DSP multispan NAC, save the settings and reboot the DSP multispan NAC for this change to take effect.

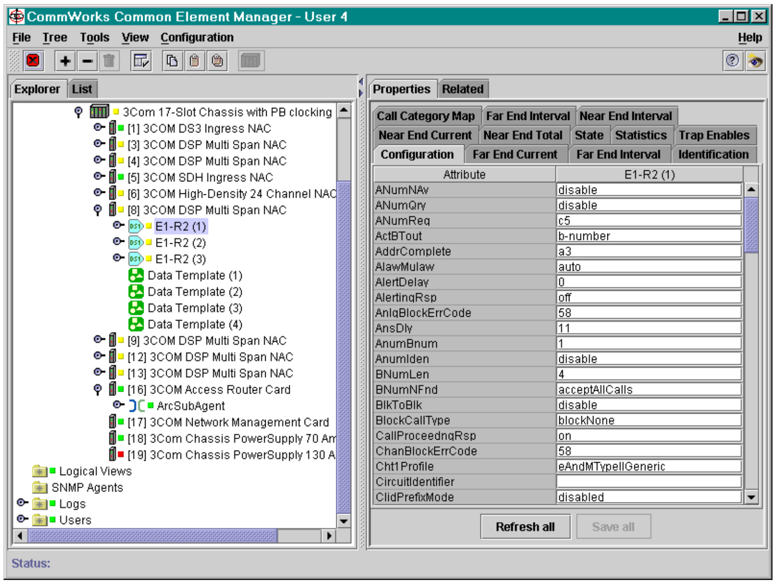
Common Element Manager

To view E1 span settings using the common element manager:

1. Click the E1 - R2 span to be viewed on the DSP multispan NAC.
2. Click the **Configuration** tab.

The **E1 - R2 Configuration** window displays showing the current span settings.

Figure 151 Viewing the E1 - R2 Span Settings



Other parameters may appear in the common element manager window that do not pertain to E1/R2.

All configuration for the E1 R2 signaling is performed from the Configuration tab. Refer to Figure 151 for the remainder of this section.

Command Line Interface

To view the line settings using CLI:

1. Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

   span1> **chdev spanx**

2. To view line settings, use the following parameter:

   span1> **display r2**

Figure 152 and Figure 153 displays the result of the atstat command.

Figure 152 Sample ATSTAT Command Results 1 of 2

```
span1> display r2

R2 Parameter Values
-------------------
Action on B-Digit Timeout (actbtout)                          END B-NUMBER
Address Complete Register Signal (addrcompl)                  A-3
Answer Line Signal Hold Value (anshold)                       0
Calling Party Number request (anumbnum) after receiving       1    B Digits
Request A-Number Identification (anumiden)                    DISABLE
Interpret I-12 as A-Number not available (anumnav)            DISABLE
A-Number Available (anumqry)                                  DISABLE
A-Number Next Digit Register Signal (anumreq)                 C-5
Failed Modem Workaround (blkfail)                             Disabled
Respond to Block Line Signal with Block (blktoblk)            DISABLE
Incoming B-Number length (bnumlen)                            4
Action on B-Number not found in DNIS Table (bnumnfnd)         ACCEPT ALL
Called Party Busy Register Signal (cldsubbusy)                B-3
Calling Party Category Register Signal (clgprtycat)           A-5
Clear Call on Unexpected Line Signal (clrcall)                ENABLE
Send Seize/Clear-Forward on Startup (clrfwd)                  DISABLE
Double Answer Delay Value (dblans)                            0
Delayed Answer Line Signal (delayans)                         100 ms
Delay from Loss of Signal to Call Clearing (delaylos)         6000 ms
Dummy A-Number (dumanum)                                      1234
End of A-Number Register Signal (endanum)                     III-15
End of B party (endbparty)                                    ENABLE
-MORE-
Forced Release (forcedrel)                                    DISABLE
Default Incoming Call Category (incomcpc)                     ANALOG
Accept Incoming Call in Glare Condition (inglare)             DISABLE
Incoming Subscriber Free Register Signal (insubfree)          B-6
Line Direction (linedir)                                      INCOMING
Line Signaling Type (linesigtyp)                              R2 Digital
Last Incoming B-Number Digit Timeout Value (lstbdtout)        2000 ms
Receive ABCD Persistence Override Value (persisov)            0
Pulsed Idle During Clear Back (piclrbck)                      ENABLE
Project ID (projid)                                           ITU-T
Register Signaling Status (regsigstatus)                      ENABLE
Register Signaling Type (regsigtyp)                           R2MFC
Release Guard Line Signal Duration (relguard)                 400 ms
Seize Acknowledge Line Signal (seizeack)                      ENABLE
B-Number Digit N Request (sndbnumn)                           A-9
B-Number Digit N-1 Request (sndbnumn1)                        A-2
B-Number Digit N-2 Request (sndbnumn2)                        A-7
B-Number Digit N-3 Request (sndbnumn3)                        A-8
First B-Number Digit Request (sndfbnum)                       A-10
-MORE-
Unused Transmit ABCD Bits (unusedabcd)                        5
Wrong Number Register Signal (wrongnum)                       B-5
```

Figure 153 Sample ATSTAT Command Results 2 of 2

```
-MORE-
Unused Transmit ABCD Bits (unusedabcd)                        5
Wrong Number Register Signal (wrongnum)                       B-5

Incoming Category Mapping Table (incatmap)

 Index        Call Category
 -----        -------------
 II-1         ANALOG
 II-2         ANALOG
 II-3         ANALOG
 II-4         ANALOG
 II-5         ANALOG
 II-6         ANALOG
 II-7         ANALOG
 II-8         ANALOG
 II-9         ANALOG
 II-10        ANALOG
 II-11        ANALOG
 II-12        ANALOG
 II-13        ANALOG
 II-14        ANALOG
 II-15        ANALOG

-MORE-

Outgoing Category Mapping Table (outcatmap)

 Index        CPC Signal
 -----        ----------
 ANALOG       II-1
 DIGITAL      II-6
 TEST         II-13
 MAINTENANCE  II-3

span1>
```

R2 or E1/R2 refer to Channelised E1 or E1/CAS.

Select the Framing Type

You can configure the DSP multispan card for the following DS1 frame types:

Table 56 DS1 Frame Types

DS1 Frame Type	Command
CCITT Recommendation G.704	set ltype e1
CCITT Recommendation G.704 with CRC	set ltype crc e1

Consult RFC 1406 for more information.

If you change the framing type for a particular span, save the settings and reboot the card for this change to take effect.

You can select the framing type for E1 span settings using either the common element manager, or the CLI.

Common Element Manager

To configure framing type using common element manager:

1. Click the E1 - R2 span to be viewed on the DSP multispan NAC.
2. Click the **Configuration** tab.

   The **E1 - R2 Configuration** window displays showing the current span settings.
3. Double click the drop-down box next to **LineType**, and select the appropriate type of framing for your system.
4. Click **Save All**.

Command Line Interface

To configure framing type using CLI:

1. Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

   ```
   span1> chdev spanx
   ```
2. Set the frame type.

   Use Table 57 to set the frame type.

Table 57 Frame Type Commands

Frame Type	Command
G.704 CAS	set ltype mfe1
G.704 CAS with CRC-4	set ltype crcmfe1

Table 57 refers to the line type tables found in RFC 1406. Consult RFC 1406 for more information.

Configuring for Short-Haul or Long-Haul

You can configure the short and long haul types using common element manager or CLI.

Common Element Manager

To change the type of haul using the common element manager:

1 Click the E1/R2 span to be configured on the DSP multispan NAC.

You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **NicCfgType** field on the Configuration tab.

The long and short haul configuration drop-down list appears.

4 Make your selection for your environment from the drop-down list.

5 Click **Save All**.

Command Line Interface

To configure the DSP multispan for the long-haul or short-haul NIC using CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

span1> **chdev spanx**

2 Enter the CLI command to set the long-haul or short-haul for the NIC.

Table 58 lists the CLI commands to set the long-haul or short-haul NIC.

Table 58 DSP multispan Long-Haul / Short-Haul NIC Types

NIC Type	Command
Long-haul	set nicfgtyp long
Short-haul	set nicfgtyp short

3 If you are using a short-haul NIC, set the signal level distance.

Table 59 lists the common element manager field on the Configuration tab and CLI commands to set the signal level distance.

Table 59 Short-Haul NIC Signal Level Distance

Signal Level Distance	Common Element Manager Field	CLI Command
0 to 200 meters	LineLength	set ds1linelength <0 to 200>

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

Table 60 lists the common element manager field on the Configuration tab and CLI commands to set the transmit line build out signaling.

Table 60 Long-Hault NIC Transmit Line Build Outs

Transmit Line Build Out	Common Element Manager Field	Command
0.0 db xmit [dB0]	XmitLineBuldOut	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. Set the transmit line build out according to the instructions given by your telephone company. Remember the more decibels you use, the greater the possibility for crosstalk; and, the fewer decibels you use, the greater the possibility for attenuation.

Verifying the Settings

You can verify the settings you just modified using either common element manager or CLI.

Common Element Manager

To view E1/R2 span settings using the common element manager:

1. Click the E1/R2 span to be viewed on the DSP multispan NAC.
2. Click the **Configuration** tab.

   The **E1/R2 Configuration** window displays showing the current span settings.

Command Line Interface

You can view the settings you just modified by selecting the appropriate commands listed in Table 61.

If necessary, view the settings you just modified.

Table 61 Setting Types

Setting Type	Command
Line signaling	display sigmode
Switch type	display swtype
Line type	display ltype

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

Selecting the Country Specific Parameters

You can select the country codes using either the common element manager or the CLI.

Common Element Manager

To change the country specific parameters using the common element manager:

1 Click the T1 span to be configured on the DSP multispan NAC.

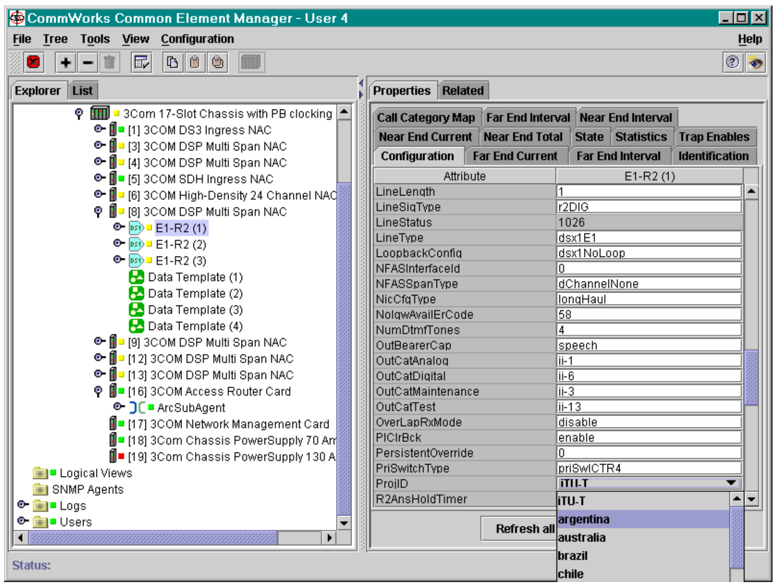
You can click more than one span by pressing the Control key while clicking.

2 Click the **Configuration** tab.

3 Double-click the **ProjId** field on the Configuration tab.

The list of the countries appears.

Figure 154 Feature Group Configuration Window



4 Select the needed country from the drop-down list.

5 Click **Save All**.

Command Line Interface

To change the country specific parameters using the CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

2 To select the country specific parameters use the following command:

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

The following is a list of the parameters for the <country specific parameter>:

Table 62 Country Parameters

Country	Country	Country
■ ITU-T	■ China	■ Mexico
■ Argentina	■ Colombia	■ New Zealand
■ Australia	■ India	■ Philippines
■ Brazil	■ Korea	■ Sweden
■ Chile	■ Malaysia	■ Venezuela

Saving the Configuration

When you finish configuring the DSP multispan, save the span and modem settings using either the common element manager or the CLI. For more information on saving configurations, refer to the *Operations Guide*.

Common Element Manager

To save the new configurations using common element manager:

1. Click **Save all** on the Configuration tab window.
2. Right-click the DSP multispan card.
3. Select **Save to NVRAM** on the Configuration pop-up list.
4. Right-click the chassis.
5. Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

Command Line Interface

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

   `span1> cmd svspcfg`

2. Select the modem you want to configure. You may configure modems 1 through 90. If a modem number is not selected, the system will default to modem 1.

   For example:

   `span> chdev mdm 25`

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

   `at&w`

   For example:

   `mdm 25> at&w`

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

```
> reboot
```

Verifying the Settings

You can verify the settings you just modified using either common element manager or CLI.

Common Element Manager

To verifyE1/R2I E1/R2 span settings using the common element manager:

1 Click the E1/R2 span to be viewed on the DSP multispan NAC.

2 Click the **Configuration** tab.

The **E1/R2 Configuration** window displays showing the current span settings.

Command Line Interface

To verify the settings you just modified, enter the CLI commands listed in Table 63.

Table 63 Setting Types

Setting Type	Command
Project ID	display projid
Line Type	display ltype

Testing the Configuration

After you have configured your DSP multispan E1/R2 card to meet your environment's requirements you will need to test the configuration. You can test this using either the common element manger or the CLI.

Common Element Manager

To test the new configurations using CLI:

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

2 Right-click the E1/R2 span on the DSP multispan NAC.

3 Select **Monitor State** from the drop-down list.

The Monitor State window appears.

4 Select the State and Class from the drop-down lists that you want to monitor for a real time display.

Command Line Interface

To test the new configurations using CLI:

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

2 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

```
span1> chdev spanx
```

3 Change to the timeslot level. Type the following command, and replace “x” with the desired time slot:

span1> **chdev tslotx**

4 Display timeslot and modem status.

span1/tslotx> **display atstat**

Figure 155 displays the result of the ATSTAT command

Figure 155 Sample of the Timeslot and Modem Configuration Display

```
span1> chdev tslot
span1/tslot0> display atstat

Tslot  Status    Modem    Status       Call ID      Span
                Connect Srvc State                  Status
 00      Fchan    N/A    UNBLOCKED    0x00000000    Alarm
 01     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 02     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 03     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 04     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 05     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 06     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 07     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 08     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 09     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 10     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 11     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 12     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 13     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 14     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 15     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
-MORE-
 16    E1CASchn   N/A    UNBLOCKED    0x00000000    Alarm
 17     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 18     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 19     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 20     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 21     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 22     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 23     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 24     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 25     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 26     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 27     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 28     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 29     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 30     Blocked   N/A    UNBLOCKED    0x00000000    Alarm
 31     Blocked   N/A    UNBLOCKED    0x00000000    Alarm

span1/tslot0>
```

5 Look for your incoming call to display in the *Connect In* column of the CLI.

16

INITIAL CONFIGURATION—E1 PRIMARY RATE INTERFACE

This chapter includes configuration procedures for various modem E1/PRI span settings.

Unless otherwise specified, all references to the DSP multispan card also apply to the HiPer DSP card.

This chapter contains the following topics:

- Accessing the Command Line Interface
- Viewing E1/PRI Signaling Settings
- Selecting PRI Line Signaling
- Selecting the Switch Type
- Select the Framing Type
- Select the Line Coding
- Saving the Current Span Configuration
- Verifying Signaling Settings
- Testing the Configuration

For additional information on commands entered through the Command Line Interface (CLI), refer to the CommWorks Total Control 1000® Enhanced Data System *DSP Multispan Command Line Interface Guide*.

This guide uses the terms span and trunk synonymously.

Accessing the Command Line Interface

This section contains procedures for running terminal emulation software to access the command line interface (CLI) menu locally. For information on configuring the DSP multispan card remotely, refer to the *Modem and Span Command Line Interface Reference*.

If you are not going to use the CLI you can proceed to the next step.

Before running a terminal emulation software program, the DSP multispan card must be cabled to your local workstation. Refer to Installing the DSP Multispan Card Set for more information.

Accessing the Terminal Emulation Software

After you have the cables connected, the next step is to run a terminal emulation software package. A familiar one is HyperTerminal.

1 Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.

2 Configure the communications application to use the COM port where the serial cable is connected.

Table 64 lists the console port settings.

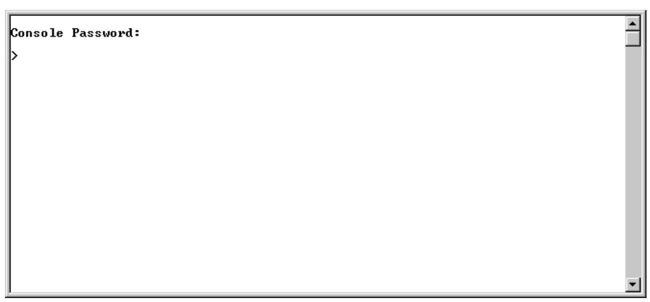
Table 64 Console Port Serial Communication Settings

Setting	Variable
Port speed	9600 bps (default)
Terminal type	VT100
Data bits	8
Parity	None
Stop bits	1
Flow control	None

3 At the terminal screen, type in your login and password.

After you log in the access router card's CLI **root command prompt** displays.

Figure 156 DSP Multispan CLI Login



Configuring E1 Primary Rate Interface

Use the following procedures to configure the DSP multispan NAC for E1 Primary Rate Interface (PRI) services.

Viewing E1/PRI Signaling Settings

The following sections provide procedures on viewing the E1 - PRI span settings.

You can view the E1 span settings using either the common element manager, or the CLI.

If you change any settings on the DSP multispan NAC, save the settings and reboot the DSP multispan NAC for this change to take effect.

Common Element Manager

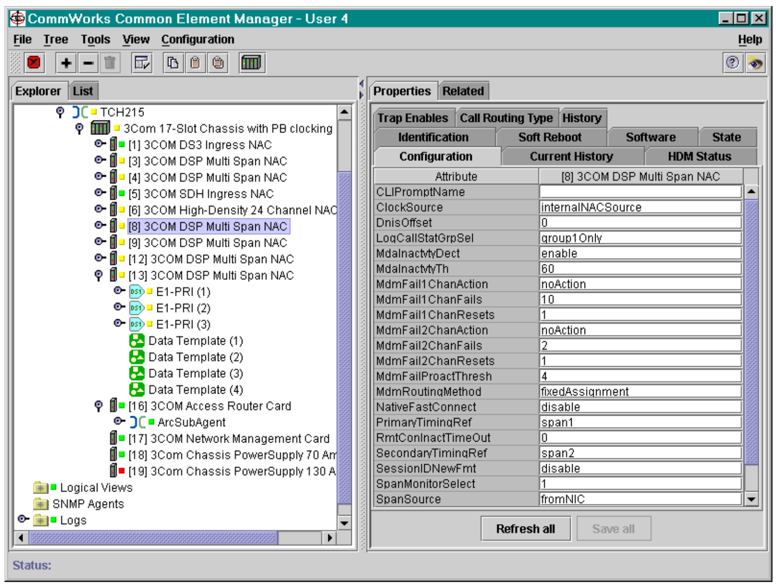
To view E1 span settings using the common element manager:

1 Click the E1 - PRI span to be viewed on the DSP multispan NAC.

2 Click the **Configuration** tab.

The **E1 - PRI Configuration** window displays showing the current span settings.

Figure 157 Viewing the E1 - PRI Span Settings



Other parameters may appear in the common element manager window that do not pertain to E1/PRI.

All configuration for the E1 R2 signaling is performed from the Configuration tab. Refer to Figure 157 for the remainder of this section.

Refer to Table 65 to view the default span settings are for E1 PRI.

Command Line Interface

To view E1 span setting using the CLI:

1 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3):

span1> **chdev spanx**

2 To view span settings, use the following parameter:

```
span1> display ccrcfig
```

Table 65 lists the default settings for the E1 span.

Table 65 Default E1 Span Settings

Span Settings	Default
Circuit Identifier	<none>
Idle Byte Pattern	254
Jitter Attenuation	attenJitterOnRcvr
Line Coding	dsx1B8ZS
Line Type	dsx1E1-MF
Loopback Configuration	dsx1NoLoop
NIC Type	longHaul
Overlap Receiving Mode	disable
Primary Switch Type	priSw5ESS
Receiver Gain	dB26
Send Code	dsx1SendNoCode
Signal Mode	MessageOriented
Transmit Clock Source	loopTiming

Selecting PRI Line Signaling

The following sections provide configuration procedures to select PRI line signaling.

You can select the E1 span settings using either the common element manager, or the CLI.

If you change the signaling mode for a particular span, save the settings and reboot the card for this change to take effect.

Common Element Manager

To configure E1 - PRI line signaling using common element manager:

1 Click the E1 - PRI span to be configured on the DSP multispan NAC.

2 Click the **Configuration** tab.

The **E1 - PRI Configuration** window displays showing the current span settings.

3 Double click the drop-down box next to **SignalMode**, and select the appropriate signaling mode for your system.

4 Click **Save All**.

Command Line Interface

To configure E1/PRI line signaling using the CLI:

1 Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3):

```
span1> chdev spanx
```

2 Select message-oriented signaling.

```
span1> set sigmode msgorien
```

The sigmode command effects all of the spans on the card.

Selecting the Switch Type

The following sections provide configuration procedures to select the switch type for E1/PRI line signaling.

If you change the type of switch for a particular span, save the settings and reboot the card for this change to take effect.

You can select the switch type for E1 span settings using either the common element manager, or the CLI.

Common Element Manager

To select the switch type using common element manager:

1 Click the E1 - PRI span to be configured on the DSP multispan NAC.

2 Click the **Configuration** tab.

The **E1 - PRI Configuration** window displays showing the current span settings.

3 Double click the drop-down box next to **PriSwitchType**, and select the appropriate type of switch for your system.

4 Click **Save All**.

Command Line Interface

To select the switch type using the CLI:

1 Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3):

```
span1> chdev spanx
```

2 Set the switch type.

Use the appropriate command from Table 66 to set the E1/PRI switch type.

Table 66 Valid E1 PRI Switch Types

PRI Switch Type	Command
NET5/CTR 4 (European ISDN)	set swtype ictr4
VN4 (France)	set swtype vn4
TS014 (Australia)	set swtype ts014

Select the Framing Type

You can select the framing type for E1/PRI span settings using either the common element manager, or the CLI.

Common Element Manager

To configure framing type using common element manager:

1. Click the E1 - PRI span to be viewed on the DSP multispan NAC.
2. Click the **Configuration** tab.

   The **E1 - PRI Configuration** window displays showing the current span settings.
3. Double click the drop-down box next to **LineType**, and select the appropriate type of framing for your system.
4. Click **Save All**.

Command Line Interface

To configure framing type using the CLI:

1. Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3):

   `set ltype esf`

2. Type one of the following commands to set the framing for this span.
   - **a** To set the framing type to Extended SuperFrame DS1 (T1/PRI), type:
   - **b** To set the framing type to AT&T D4 format DS1 or Super Frame (T1/PRI), type:

   `set ltype d4`

   - **c** To set the framing type to CCITT Recommendation G.704 - (E1/PRI); type:

   `set ltype e1`

The above set commands refers to the line type tables found in RFC 1406. Consult RFC 1406 for more information.

You can configure the DSP multispan card for the following DS1 frame types:

Table 67 DS1 Frame Types

DS1 Frame Type	Command
CCITT Recommendation G.704	set ltype e1
CCITT Recommendation G.704 with CRC	set ltype crc e1

Consult RFC 1406 for more information.

If you change the framing type for a particular span, save the settings and reboot the card for this change to take effect.

Select the Line Coding

You can select the line coding for E1 span settings using either the common element manager, or the CLI.

If you change the line coding for a particular span, save the settings and reboot the card for this change to take effect.

Common Element Manager

To configure line coding using common element manager:

1. Click the E1 - PRI span to be viewed on the DSP multispan NAC.
2. Click the **Configuration** tab.

   The **E1 - PRI Configuration** window displays showing the current span settings.
3. Double click the drop-down box next to **LineCoding**, and select the appropriate type of line coding for your system. Default is b8zs.
4. Click **Save All**.

Command Line Interface

1. Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3):

   ```
   set ltype esf
   ```
2. To configure line coding type using the CLI:

   ```
   span1> set lcoding b8zs
   ```

Saving the Current Span Configuration

You can save the current configuration settings for span settings using either the common element manager, or the CLI.

Common Element Manager

To save the configuration using common element manager:

Not performing the following procedure may cause you to lose span settings when rebooting the DSP multispan card.

To save the span configuration to the DSP multispan NVRAM:

1. Right-click the DSP multispan, and select **Configuration**.
2. Click **Save to NVRAM**.

   A confirmation box displays.
3. Click **OK** to return to the common element manager explorer view.

   The Command Status box shows a message indicating a successful execution.
4. Right-click the DSP multispan, and select **Maintenance**.
5. Click **Hardware Reset** from the drop-down box.

   The Command Status box shows a message indicating a successful execution.
6. Right-click the chassis.
7. Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

8. Click **Close**.

When you finish configuring the span, you must save the configurations to NVRAM and then perform a hardware rest for them to be recognized by Total Control 1000.

Common Element Manager

To save the new configurations using common element manager:

1. Click **Save all** on the Configuration tab window.
2. Right-click the DSP multispan card.
3. Select **Save to NVRAM** on the Configuration pop-up list.
4. Right-click the chassis.
5. Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

Command Line Interface

Before the new configurations take effect you must save them.

To save the span configuration using CLI:

1. Select the span you want to save. You may save span 1 through 3 for E1 and spans 1 through 4 for T1. If a span number is not selected, the system defaults to span 1.

   For example:

   span1> **chdev span 2**

2 Save the span configuration by entering the following command:

span2> **cmd svspcfg**

span 1> **at&w**

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

> **reboot**

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

Verifying Signaling Settings

You can verify the signaling settings for E1 span settings using either the common element manager, or the CLI.

Common Element Manager

To view E1 span settings using the common element manager:

1 Click the E1 - PRI span to be verified on the DSP multispan NAC.

2 Click the **Configuration** tab.

The **E1 - PRI Configuration** window displays showing the current span settings.

3 Verify the settings are what you need for your environment.

Also, the CAR and LPBK/D-ALM LEDs should be green on the DSP multispan.

Command Line Interface

To verify the configuration settings using CLI:

1 Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3):

set ltype esf

2 Display the span configuration.

span1> **display ccrcfig**

Testing the Configuration

After you have configured your DSP multispan E1/PRI card to meet your environment’s requirements you will need to test the configuration. You can test this using either the common element manger or the CLI.

Common Element Manager

To test the new configurations using CLI:

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

2 Right-click the E1/PRI span on the DSP multispan NAC.

3 Select **Monitor State** from the drop-down list.

The Monitor State window appears.

4 Select the State and Class from the drop-down lists that you want to monitor for a real time display.

Command Line Interface

To test the configuration using the CLI:

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

2 Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3):

```
span1> chdev spanx
```

3 Change to the timeslot. Type the following command, and replace "x" with the desired time slot:

```
span1> chdev tslotx
```

4 Display timeslot and modem status.

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

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

17 INITIAL CONFIGURATION—SS7 SIGNALING

This chapter describes SS7 Signaling support for E1 spans and provides related configuration procedures.

Unless otherwise specified, all references to the DSP multispan card also apply to the HiPer DSP card.

This chapter contains the following topics:

- Overview
- SS7 Description
- Accessing the Command Line Interface
- Configuring SS7 Signaling Support

For T1 applications we recommend that you use the SS7 Gateway A7 version 1.0.92.0 dated 12/05/2001. For E1 applications we recommend that you use SS7 Gateway C7 version 1.0.91.5 dated 12/21/2001.

Overview

In order for your CommWorks Total Control 1000® to accept calls from an SS7 signaling network, the SS7 enabled versions of the software must be installed on the following Total Control 1000 cards:

- DSP multispan
- Access router card

Managing the System

You can use either the common element manager or Command Line Interface (CLI) to configure, maintain, or trouble clear SS7 configurations on the DSP multispan card.

Common Element Manager

Use common element manager to configure SS7 in the router card through Simple Network Management Protocol (SNMP).

Command Line Interface

Use CLI to issue various commands for configuring, maintaining or trouble clearing the chassis as described below. See the SS7 chapter in the *Modem and Span Command Line Interface Reference* for all supported CLI commands.

SS7 Description

SS7 is a common channel signaling system that provides flexibility in handling data calls as they enter the Public Switched Telephone Network (PSTN).

The PSTN was originally designed to handle voice calls. The expanded use of the Internet and Remote Access Servers (RAS) greatly increased the number of data calls entering the PSTN. This increase causes congestion at the terminating End Office (EO) because the data calls, on average, last longer than voice calls. An SS7 signaling gateway, working with the Total Control® 1000 Enhanced Data System, offers a solution to this congestion. It recognizes data calls and can redirect them from the PSTN to a separate data network before they arrive at the terminating EO. Without SS7, there is no option to reroute these calls.

SLAP Protocol

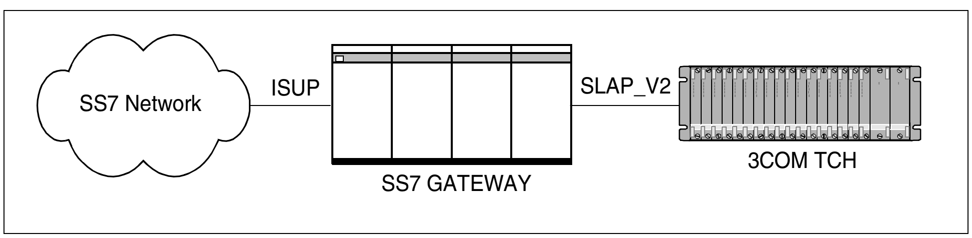
The SS7 gateway employs Signaling LAN Application Protocol (SLAP) to link the SS7 network to the Total Control 1000 system. SLAP, a CommWorks proprietary protocol, is the interface between the access router card and the external SS7 Gateway system. It replaces the D-channel signaling that normally exists in an ISDN PRI interface and also defines the messages to facilitate system start up, shut down, and error recovery.

ENFAS Protocol

With SS7, the modem card continues to terminate the T1/E1 spans, but without having to handle any signaling associated with the span. Instead, the modem card takes the signaling from the router card (the router card gets it over the SLAP connection from gateway) over the packet bus through Enhanced Non-facility Associated Signaling (ENFAS) Protocol. ENFAS is the interface between the access router card and the individual modem cards.

The following figure illustrates how the Total Control 1000 enhanced data system connects to an SS7 signaling gateway.

Figure 158 Total Control 1000 SS7 Block Diagram



CAUTION: *Please configure the SS7 signaling gateway according to your customized needs before configuring the access router card and the modem cards for SS7 signaling services.*

Accessing the Command Line Interface

This section contains procedures for running terminal emulation software to access the command line interface (CLI) menu locally. For information on configuring the DSP multispan card remotely, refer to the *Modem and Span Command Line Interface Reference*.

If you are not going to use the CLI you can proceed to the next step.

Before running a terminal emulation software program, the DSP multispan card must be cabled to your local workstation. Refer to Installing the DSP Multispan Card Set for more information.

Accessing the Terminal Emulation Software

After you have the cables connected, the next step is to run a terminal emulation software package. A familiar one is HyperTerminal.

1 Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.

2 Configure the communications application to use the COM port where the serial cable is connected.

Table 68 lists the console port settings:

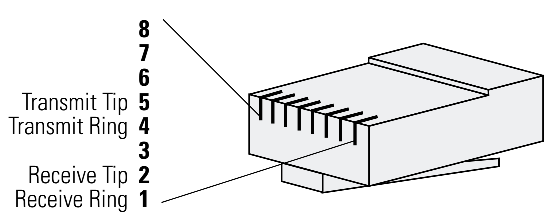
Table 68 Console Port Serial Communication Settings

Setting	Variable
Port speed	9600 bps (default)
Terminal type	VT100
Data bits	8
Parity	None
Stop bits	1
Flow control	None

Checking the Network Connection

Connect an IMT T1 or E1 line to the span port jack located on the corresponding DSP multispan T1/E1 NIC. Use a straight-through cable with an RJ-48C (RJ-45) 8-pin modular jack with the pinout shown in Figure 159.

Figure 159 RJ-48C (RJ-45) 8-pin Modular Jack Diagram



If the physical layer connection is good, the Alarm light [red] goes off and the CD light [green] goes on.

3 At the terminal screen, type in your login and password.

After you log in the access router card's CLI **root command prompt** displays.

Figure 160 DSP Multispan CLI Login

```
Console Password:
>
```

Configuring SS7 Signaling Support

For SS7 services, the DSP multispan continues to terminate T1/E1 span lines, but without having to handle any signaling associated with the span. Instead, the DSP multispan takes the signaling from the access router card over the packet bus through Enhanced Network Facility Associated Signaling (ENFAS). The span connected to the DSP multispan T1/E1 NIC must be an InterMachine Trunk (IMT) configured line.

You can configure the DSP multispan using either the SS7 enabled total control manager or the CLI. Before configuring the card, make sure it is properly connected. Refer to the Installing the DSP Multispan Card Set chapter for more information.

Configure your card for the appropriate T1/E1 signaling before proceeding.

For the procedures using total control manager refer to Total Control Manager for Windows and UNIX *Getting Started Guide.*

To enable additional-cost features, contact your CommWorks sales representative to obtain the appropriate feature enable key. You need to provide the serial number of the network management card on which you are enabling the feature.

The feature enable string is also called an enable key.

Common Element Manager

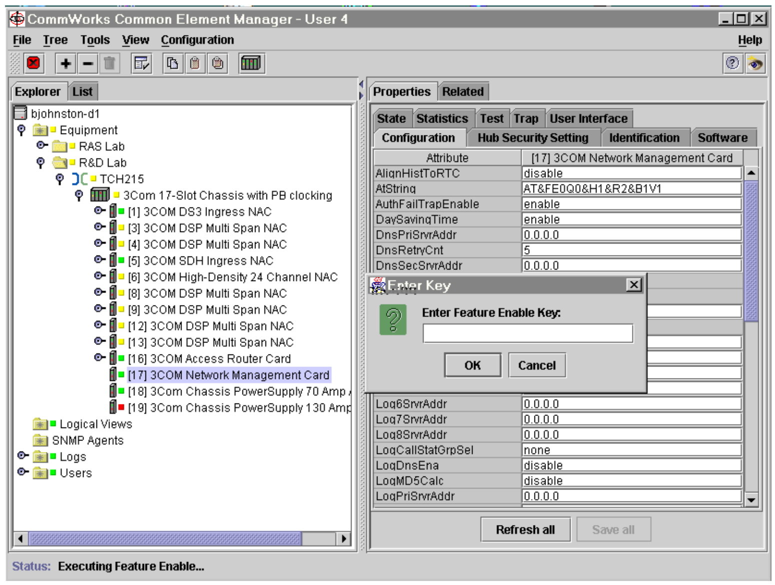
To enable additional cost features using common element manager:

1 Right-click the network management card.

2 Select **Feature Enable** from the drop-down menu.

The Feature Key box appears.

Figure 161 Feature Key Box



3 Enter the new feature key.

4 Click **OK**.

5 Reboot the network management card.

   a Right-click the network management card.

   b Select **Maintenance** and click **Software Update**.

For more information about other added-cost features, refer to the CommWorks Technical Support web site: http://totalservice.commworks.com/.

To select ESIG support on the DSP multispan through common element manager:

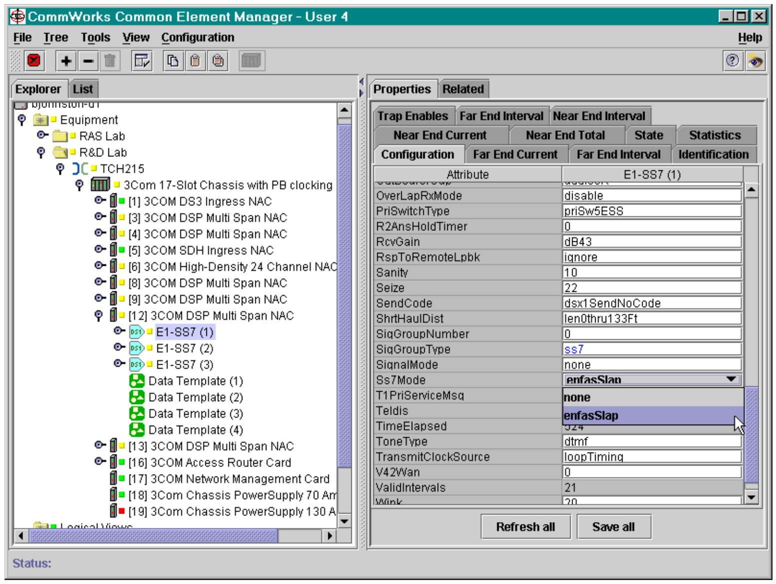
1 Select the E1-PRI being configured.

   You can click more than one span by pressing the Control key while clicking.

2 Double-click the **SS7Mode** field on the Configuration tab.

The SS7Mode configuration drop-down list appears.

Figure 162 SS7 Mode Configuration Window



3 Select **enfasSlap**.

4 Double-click the **ESIG31ChnlMode** field on the Configuration tab.

5 Select **ESIG31ChnlMode**.

6 Double-click the **SigGroupType** field on the Configuration tab.

7 Select **SS7**.

8 Click **Save All**.

Command Line Interface

To select ESIG support on the DSP multispan using the CLI:

1 Change to the span level by entering this command from the CLI command prompt:

```
chdev span 1
```

The span level command prompt appears:

```
span 1>
```

For DSP multispan modem cards, configure all three spans for SS7 signaling.

1 From the span level command prompt, enter:

```
set cfgss7mode enfas_slap
```

2 From the span level command prompt, enter the following command to save your configuration settings:

```
cmd svspcfg
```

Selecting SLAP Signal Mode Support

You can select SLAP signaling support on the DSP multispan card using either the common element manager, or the CLI.

Common Element Manager

To select SLAP signal mode support on the DSP multispan through common element manager:

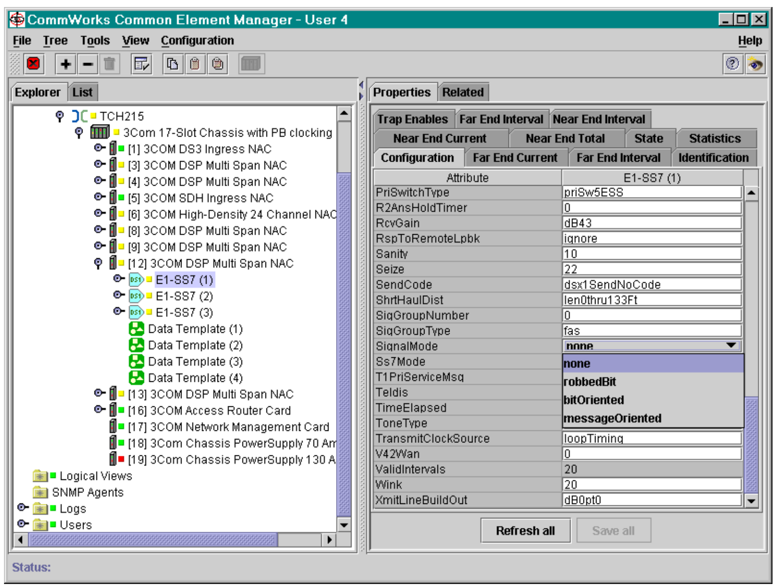
1 Select the E1-PRI being configured.

You can click more than one span by pressing the Control key while clicking.

2 Double-click the **SignalMode** field on the Configuration tab.

The **SignalMode** configuration drop-down list appears.

Figure 163 Signal Mode Configuration Window



3 Select **none**.

4 Click **Save All**.

Command Line Interface

1 From the span level command line prompt, enter:

```
set sigmode nosig
```

The sigmode command effects all of the spans on the card.

2 From the span level command prompt, enter the following command to save your configuration settings:

`cmd svspcfg`

Saving SS7 Signaling Configurations

Before the new configurations take effect you must save them. Enter the following command to save the configurations for the DSP multispan card:

You can save your configurations to NVRAM on the DSP multispan card using either the common element manager, or the CLI.

Common Element Manager

To save the span configuration to the DSP multispan NVRAM using common element manager:

1. Right-click the DSP multispan, and select **Configuration**.
2. Click **Save to NVRAM**.

   A confirmation box appears.
3. Click **OK** to return to the common element manager explorer view.

   The Command Status box shows a message indicating a successful execution.
4. Right-click the DSP multispan, and select **Maintenance**.
5. Click **Hardware Reset** from the drop-down box.

   The Command Status box shows a message indicating a successful execution.
6. Right-click the chassis.
7. Select **Rediscover**.

   This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis
8. Click **Close**.

Command Line Interface

To save both modem and span settings in flash memory using the CLI:

Saving a Span Configuration

1. Select the span you want to save. You may save span 1 through 3 for E1 and spans 1 through 4 for T1. If a span number is not selected, the system defaults to span 1.

   For example:

   span1> **chdev span 2**

2 Save the span configuration by entering the following command:

span2> **cmd svspcfg**

Saving a Modem Configuration

1 Select the modem you want to save. You may save modem 1 through 96 for E1 and modems 1 through 90 for T1. If a modem number is not selected, the system defaults to modem 1.

For example:

span2> **chdev mdm 2**

2 Save the modem configuration by entering the following command.

at&w

For example:

mdm2> **at&w**

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

mdm2> **chdev root**

mdm2> **reboot**

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

Verifying the DSP Multispan SS7 Mode

Use the commands documented below to verify whether the DSP multispan is in SS7 signaling mode. The first four are at the span level and provide information as specified in the following table:

Table 69 Signaling Mode Verification Commands

Command	Definition
display smactive display ss7modeactive	These two commands display the signal mode at the time of the initial boot up.
display sigmode display cfgss7mode	Changes to these two modes does not take effect until you save and reboot.

Span-Level Commands

Access the appropriate span level. Type the following command, and replace “x” with the desired span level (e.g., 1, 2, 3):

span1> **chdev spanx**

Below are the four span-level commands, followed by an example and a brief explanation of each.

1 span1> display sigmode

The ‘NO SIGNALING’ response means the span is configured for SS7.

A ‘MESSAGE ORIENTED’ response would mean the span is configured for PRI signaling.

2 span1> display smactive

The ‘NO SIGNALING’ response means that Span1 is not receiving any signaling over the span line terminated at the DSP multispan SS7 NIC and that, therefore, the DSP multispan SS7 NAC is receiving signaling from the access router card.

A ‘MESSAGE ORIENTED’ response would mean the span is configured for PRI signaling.

3 span1> display cfgss7mode

The ‘Enfas_slap’ response means the span is configured for SS7.

A ‘none’ response would mean the span is configured for conventional signaling, such as PRI or Channelized T1. If the response is ‘none’, you can determine what type of conventional signaling the span is configured for by executing this command:

4 span1> display ss7modeactive

The ‘Enfas_slap’ response means the active signaling for this span is SS7.

A ‘none’ response would mean the span is configured for conventional signaling, such as PRI or Channelized T1. If the response is ‘none’, you can determine what type of conventional signaling the span is configured for by executing this command:

Two new messages have been added to this command. They are the bolded ones above that were specifically created for SS7

Span Card-Level Commands

Table 70 lists the SS7 span card-level commands and their functions:

Table 70 SS7 Span Card-Level Commands

Command	Function
enfastats	Displays that ENFAS signaling link is “READY” along with transmitted/received statistics.
epblnkstate	Displays that Packet Bus signaling link to access router card is ready.

To enter a span card-level command, type:

span1> **chdev spncard**

Listed below are the two span card level commands, followed by an example and a brief explanation of each:

spncard> **display enfastats**

The command should display that the Enhanced Network Facility Associated Signaling (ENFAS) signaling link is ready and provide transmitted/received statistics.

`display epblnkstate`

The command should display information on the Packet Bus signaling link to the access router card. There are three possible status messages as shown in Table 71.

Table 71 Staus Message Explanations

Status	Explanation
Ready	The packet bus signaling link to access router card is ready.
Open	The access router card is not connected or is having problems.
Closed	The link between the access router card and the SS7 gateway is down.

Displaying the Operational State of a DS0

Display the operational state of a particular DS0 by using the following procedure:

1 Access the appropriate span level. Type the following command, and replace “x” with the desired span level, for example1, 2, 3:

```
span1> chdev spanx
```

2 Display the DS0 statuses by entering:

```
span 1> display atp
```

The resulting screen displays the status of each DS0. Table 72 lists the different statuses:

Table 72 DS0 Statuses

DS0 Status	Definition
Idle	The link is open, but not in use.
Dial In	An incoming call has been received for this DS0 and is in the process of being connected.
Dial Out	An outgoing call is being initiated for this DS0 and is in the process of being connected.
Conn In	An incoming call has been connected on this DS0.
Conn Out	An outgoing call has been connected on this DS0.
Disc	A call is being disconnected.
Fchan	This DS0 is reserved for framing.
Lpbk	The link between the DSP multispan SS7 and the access router card is in a loop back state.

DS0 Loop Back State in SS7 Mode

There is a new DS0 state "LPBK" for SS7. This new state displays when a DS0 is put in loop back mode by the SS7 gateway when, for example, doing continuity testing.

Timeslot-Level Commands

To enter a timeslot-level command, type:

```
chdev span\tslotx
```

where x is the timeslot number

You receive the response, **span\tslotx>.**

If you are already at the span level, you only need to type **chdev tslotx**, where, again, x is the timeslot number.

*The **Change Timeslot (chdev tslot)** command moves you to a specified timeslot. You can switch to 1-24 for a T1 device or 0-31 for an E1 device.*

For the SS7 enabled E1, the timeslots are allocated as follows:

- Timeslot 0 is the framing channel.
- Timeslots 1-31 are the traffic channels.
- Timeslot 16 is unavailable as a bearer channel.

To verify the DS0 loop back cause, go to the time slot prompt for which the DS0 status is "LPBK" and type:

```
display ds0lpbkcause
```

The response is either "None" or "SLAP (SS7 Gateway Initiated)".

V

DS-3 Ingress Card

Chapter 18 DS-3 Ingress Card Overview

Chapter 19 Installing the DS-3 Ingress Card Set

Chapter 20 Initial Configuration—DS-3 Ingress Card

18

DS-3 INGRESS CARD OVERVIEW

This chapter provides an overview of the DS-3 ingress card set. The card set contains the Network Interface Card (NIC) and the Network Application Card (NAC).

This chapter contains the following topics:

- Product Description
- Product Compatibility

Product Description

The following section describes the DS-3 ingress card set, including hardware standards, applications, and physical interfaces.

Introduction

The Total Control® 1000 Enhanced Data System is a powerful data communications platform that can support a broad variety of applications. The applications that can be accommodated are governed by NACs and NICs that are installed in the chassis midplane.

The DS-3 ingress card set is part of the Total Control 1000 enhanced data system. The DS-3 card set provides Wide Area Network (WAN) ingress options for the DSP multispan modem system.

The DSP multispan NAC possesses a four span modem architecture containing 96 port options for T1 applications and a three span modem architecture containing 90 port options for E1 applications. You have the choice of providing WAN ingress access through four T1 spans on a DSP multispan T1 NIC, or three E1 spans on a DSP multispan E1 NIC, or one T3 span on the DS-3 ingress card set. This allows you to configure and manage your Total Control 1000 hub according to your customized needs.

Scalability

Since both the hardware and software are scalable, any volume increase in the network is addressed by reconfiguring the software or upgrading the system hardware to create a more powerful system.

Hardware Standards

The DS-3 ingress NIC receives DS0 ingress signals (up to 672) through a single DS-3 line and passes this data to the DS-3 ingress NAC across one of several backplane Time Division Multiplexed (TDM) busses. These calls are terminated on DSP multispan modems. Once the modem processing is complete, the DSP multispan NAC passes the data across the Packet Bus to the access router card. The access router card performs encryption and standard routing functions.

In addition, the DS-3 ingress NIC contains two RS-232 serial interfaces. The Console port allows the user to configure the DS-3 ingress NAC through the Command Line Interface (CLI), and the AUX port is used to perform software downloads. See Figure 165 for a detailed diagram of the card's face plate.

Refer to the Total Control 1000 Modem and Terminal Adapters Features Guide *and the* Total Control 1000 Span Features Guide *for more detailed information regarding the interworking functions of the DSP/DS-3 modem architecture.*

External Interfaces

The following section provides information regarding DS-3 ingress card set external interfaces.

NAC Front Panel Interfaces

Figure 164 shows the DS-3 ingress NAC physical interfaces.

Figure 164 DS-3 Ingress NAC Front Panel Interfaces

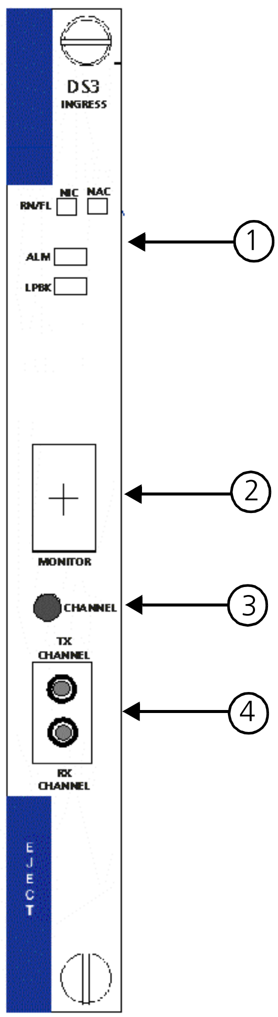


Table 73 refers to the callouts in Figure 164.

Table 73 DS-3 Ingress NAC Front Panel Interfaces

Callout	Interface
1	RN/FL NAC Status LED Indicator
	RN/FL NIC Status LED Indicator
	ALM Status LED Indicator
	LPBK Status LED Indicator
2	Monitor Port LED Indicator
3	Channel Line Pushbutton
4	Dual Bantam Jack

Status LED Indicators The DS-3 ingress NAC front panel contains two types of Light Emitting Diode (LED) indicators that are useful for locating and monitoring problems. The four status LEDs located at the top of the front panel are red, green and amber, and are used to indicate status within a chassis environment. Refer to the Trouble Locating and Clearing appendix for more information.

Monitor Port LED Indicator The Monitor Port LED Indicator has a four-character, seven-segment display. The first character displays the DS3 line status. The middle two characters display the currently selected DS1 channel line (1 to 29 where 29 is the BITS span) for the Dual Bantam Jack. The last character displays the current status of the selected DS1 line.

The format of the first and fourth characters is:

- Blank—No Alarm; the system is operational or in power up
- A—Alarm Indication Signal (AIS); Unframed All Ones Alarm
- R—Remote Alarm Indicator (RAI); Remote Frame Alarm
- L—Loss of Signal (LOS)
- Q—Quasi-Random Signal Source (QRSS)

Channel Line Pushbutton A Channel Line Pushbutton switch selects which DS1 channel to monitor in one number increments and is shown on the Monitor Port LED Indicator to display the selected DS1 channel.

Dual Bantam Jack The DS-3 ingress NAC has a dual bantam jack outlet located on the front panel of the card. You can monitor status of both the transmit (Tx) and receive (Rx) paths on any DS1 signal. Use the Channel Line Pushbutton or Total Control Manager to select the desired DS1 line.

NIC Back Panel Interfaces

The DS-3 ingress NIC has the following physical interfaces located on the card's face plate.

Figure 165 DS-3 Ingress NIC Face Plate

Accessing the Command Line Interface

To access the Command Line Interface (CLI) of the DS-3 ingress NAC, connect the correct cables to the NIC's console port. Refer to the *Installation* chapter for more information.

Applications

Use the DS-3 ingress card set to give you T3 WAN ingress access. The DS-3 ingress card set is an option for replacing the T1 span interface with a single T3 interface. You multiply your call volume by using a simpler DS-3 connection. Also, cabling to and from the chassis is reduced greatly when implementing DS-3 ingress options.

Remember, organize your Total Control 1000 chassis according to your needs and always manage the cards in your chassis to support your estimated call load.

Product Compatibility

The DS-3 ingress NIC is compatible with the following hardware and software components.

NIC Compatibility

The DS-3 ingress NAC is only compatible with the DS-3 ingress NIC.

NAC Compatibility

The DS-3 ingress NIC is only compatible with the DS-3 ingress NAC.

Total Control 1000 Compatibility

The DS-3 ingress NAC is compatible with the following Total Control 1000 products:

- DSP multispan NAC
- DSP multispan T1 NIC
- DSP multispan E1 NIC
- Access router card
- Network Management Card (with Total Control Manager)

Noncompatibility Information

The DS-3 ingress NIC does not coexist with the following Total Control products:

- HiPer™ DSP NAC
- HiPer DSP T1/E1 NIC
- HiPer Network Management Card
- EdgeServer™ Pro
- EdgeServer v1.6 or earlier
- HiPer TRAX/x.25
- 486 x.25
- HiPer API
- HiPer SS7i
- 486 API
- Network Management Card 4/16 (486)
- Quad Modem
- Dual PRI
- NETServer

Software Compatibility

Make sure you have the correct software version installed on your DS-3 ingress NAC. Refer to the "Total Control Software Compatibility Matrix" found on CommWorks' Carrier Networks support website - http://totalservice.commworks.com - to check software compatibility. If you have a new DS-3 ingress card set, the most current software has already been installed on your cards.

To download the most current software version, refer to the *Software Download Getting Started Guide* for detailed installation instructions. Use the Software Download-2 (SDL-2) procedure to download software to the DS-3 ingress cards.

19 INSTALLING THE DS-3 INGRESS CARD SET

This chapter contains the installation requirements, procedures, and verification for the DS-3 ingress card set. The card set contains the Network Application Card (NAC) and Network Interface Card (NIC).

This chapter contains the following topics:

- Installation Requirements
- Installation Procedure
- Installation Verification

For assistance in troubleshooting the DS-3 ingress card set refer to Appendix A, Trouble Locating and Clearing.

For the technical specifications for this card, refer to Appendix B, Technical Specifications.

Installation Requirements

The following section describes requirements necessary to install the DS-3 ingress NIC for all network applications.

T1/E1 Applications

Standard T1 lines terminate at span ports found on the DSP multispan T1 NIC, and E1 lines terminate at span ports found on the DSP multispan E1 NIC. You must install the corresponding DSP multispan NIC before installing a DSP multispan Network Application Card (NAC) in a Total Control® 1000 chassis.

DS-3 Applications

If you are using DS-3 applications, you must add a DS-3 ingress NAC/NIC card set to your chassis to terminate ingress DS-3 lines. DS-3 lines use a special cable connection not supported by standard DSP multispan T1 or E1 NICs.

DSP multispan NACs supporting DS-3 ingress calls do not use DSP multispan T1 or E1 NICs. DS-3 ingress calls enter through the DS-3 ingress NIC; the DS-3 ingress NAC processes these calls and terminates them on DSP multispan NAC modems. Therefore, the DSP multispan T1 or E1 NIC slot are not functional in this configuration option. Cover the empty slot with a blank safety panel when instructed below.

The DS-3 ingress NAC must be in slot one of the Total Control 1000 chassis. If you are planning on using future DS-3 card sets, reserve slot two for a redundant DS-3 ingress NAC. Cover slot two with a safety panel, and keep it available for future use.

Installation Procedure

The installation procedure is the same for both NIC and NAC cards except where noted. The NIC is installed in the back of the chassis and the NAC is installed in the front of the chassis.

ESD: To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the NAC.

Install the card set with or without power applied to the chassis.

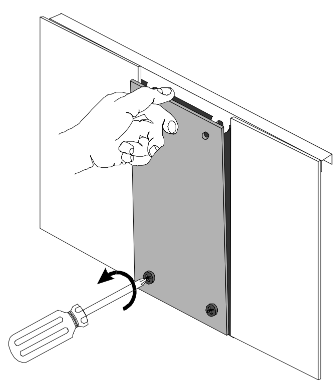
To install the DS-3 card set:

1 Prepare to place the DS-3 ingress card set in slot 1 of your Total Control 1000 chassis. If you are planning on using future DS-3 cards, reserve slot 2 for a redundant DS-3 ingress card. Cover slot 2 with a safety panel and keep it available for future use.

For managed chassis, slot 17 is reserved for the 10/100 Ethernet AUX I/O NIC (used in coordination with the Network Management Card).

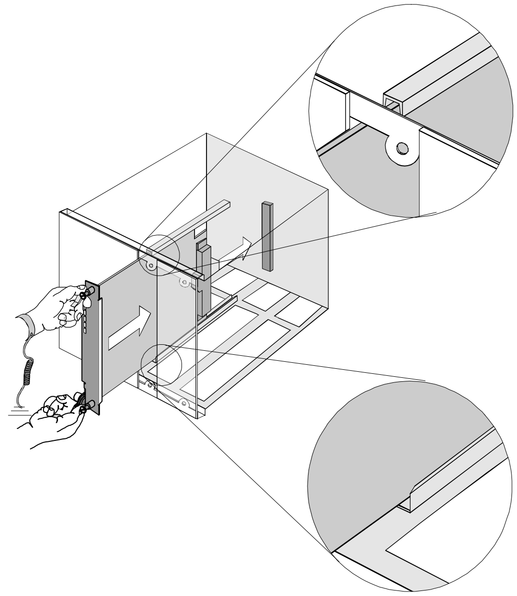
2 Use a #2 Phillips screwdriver to remove the safety panel covering this slot.

Figure 166 Removing the Safety Panel



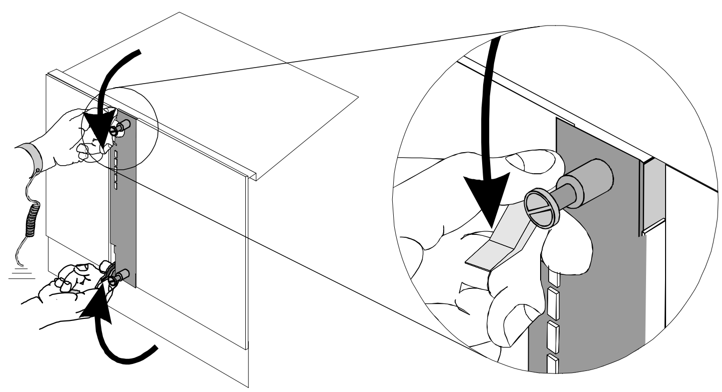
3 Insert the card between the slot's upper and lower card guides.

Figure 167 Inserting the DS-3 Network Application Card



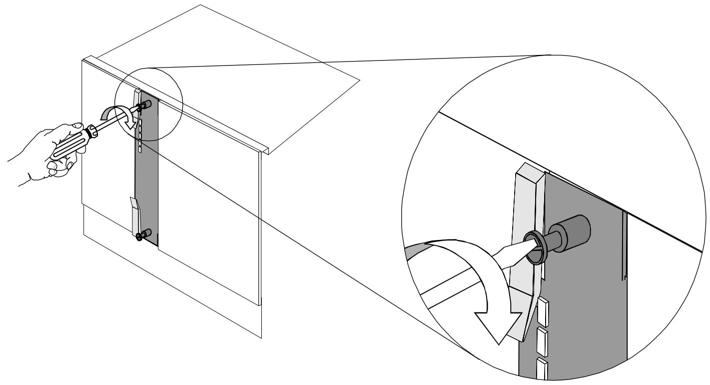
4 Holding the tabs perpendicular to the card's front panel, slide the card into the chassis, until the front of the card is flush with the chassis. Push the tabs toward each other to secure the card.

Figure 168 Securing the DS-3 Network Application Card



5 Use a slotted screwdriver to tighten the screws on the front panel.

Figure 169 Tightening the Front Panel Screws



6 Cover any unused chassis slots with safety panels.

Additional NIC Installation Instructions

7 Connect the correct cable to the DS-3 ingress NIC's console port. This allows you to access the Command Line Interface (CLI) of the DS-3 ingress NAC.

See Figure 170 below.

Figure 170 DS-3 Ingress NIC Cabling

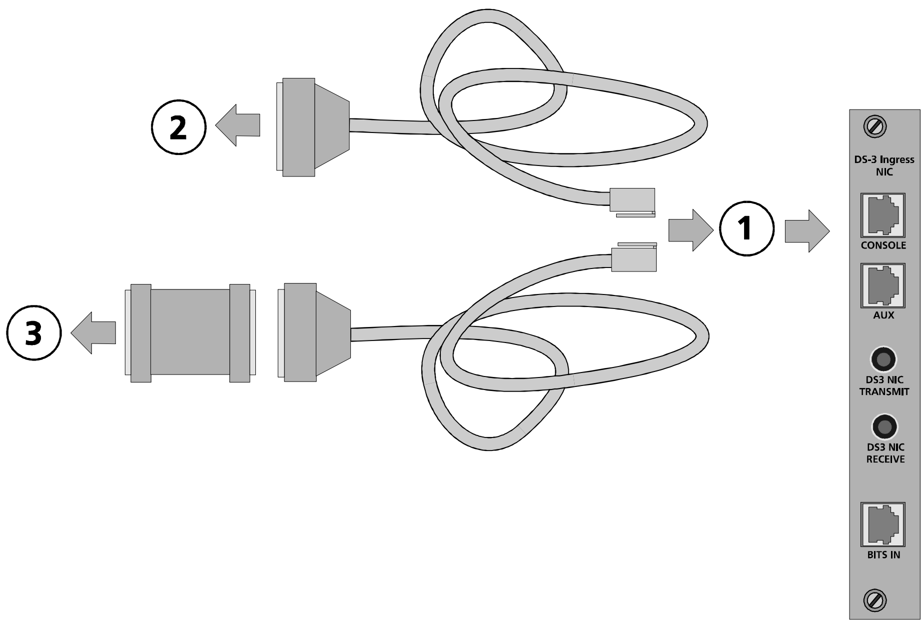


Table 74 describes the callouts of Figure 170.

Table 74 DS-3 Ingress NIC Cabling

Callout Number	Description
1	RJ-45 connector to NIC's console port
2	DB-25 male connector to modem for remote operations
3	DB-25 female-to-female null modem adapter to PC or terminal COM port

8 Connect the DS-3 Transmit and Receive cables to the DS-3 ingress NIC port options.

9 Apply power to the chassis if needed.

Installation Verification

Verify installation by observing the LEDs after installing and powering the NAC and corresponding NIC.

Network Application Card Verification

To verify the installation of the DS-3 ingress NAC:

- The RN/FL LED should be solid green.
- If the RN/FL LED does not light, or is solid red or flashing red, there is an error. Refer to the *Trouble Locating and Clearing* appendix for more information.

Network Interface Card Verification

Once the NAC is installed, the LEDs (if available) on the corresponding DS-3 ingress NIC should show activity.

20 INITIAL CONFIGURATION—DS-3 INGRESS CARD

This chapter provides instructions for the initial configuration of the DS-3 ingress Network Application Card (NAC).

This chapter contains the following topics:

- Required Information
- Network Cabling
- Configuring DS-3 for T1/PRI Services

Required Information

The following information is beneficial for reference when configuring the DS-3 ingress NAC.

Configuration Options

You have several configuration options to choose from. See Table 75 for more information.

Table 75 Configuration Options

Configuration Option	Configuration Interface
Modems and spans using MIBs	Windows 95/98, Windows NT, or UNIX Total Control Manager or SNMP and a MIB browser
Modems and spans using a Command Line Interface (CLI)	Windows 95/98, Windows NT, or UNIX CLI in conjunction with your preferred terminal program (e.g., HyperTerminal)

Trunk Line Service

Before configuring your DS-3 ingress NAC, order your DS3 or T3 trunk line service from the local telephone company.

For Total Control 1000 System 4.2, the DS-3 ingress NAC does not support Channelized T1/E1 or E1/Primary Rate Interface services. The DS-3 ingress NAC supports T1/PRI applications.

Required DS3 Line Information

When you order your DS3 or T3 trunk line service from the telephone company, obtain the necessary DS3 line information. Record your DS3 line information below for future reference.

Table 76 Required DS3 Line Information

Information	Span variable	Typical value	Your value
Line Length	d3llength	50	
Primary Timing Reference	d3ptimref	Active DS1 in the DS3 bundle	
Secondary Timing Reference	d3stimref	internal	

Required DS1 Line Information

When you order your DS3 or T3 trunk line service from the telephone company, obtain the necessary DS1 line information. Record your DS1 line information below for future reference.

Table 77 Required DS1 Line Information

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.

Network Cabling

After obtaining line information from the local telephone company, you are ready to physically connect the corresponding Network Interface Card (NIC) to the Total Control 1000 hub. Once you connect the appropriate cabling to the NIC, you are ready to configure your DS-3 ingress NAC through the Command Line Interface (CLI).

Accessing the Command Line Interface

This section contains procedures for running terminal emulation software to access the command line interface (CLI) menu locally. For information on configuring the DS-3 card remotely, refer to the *Modem and Span Command Line Interface Reference*.

If you are not going to use the CLI you can proceed to the next step.

To access the CLI of the DS-3 ingress NAC, connect the following cables to the NIC's console port. See Figure 171 below.

Figure 171 DS-3 Ingress NIC Cabling

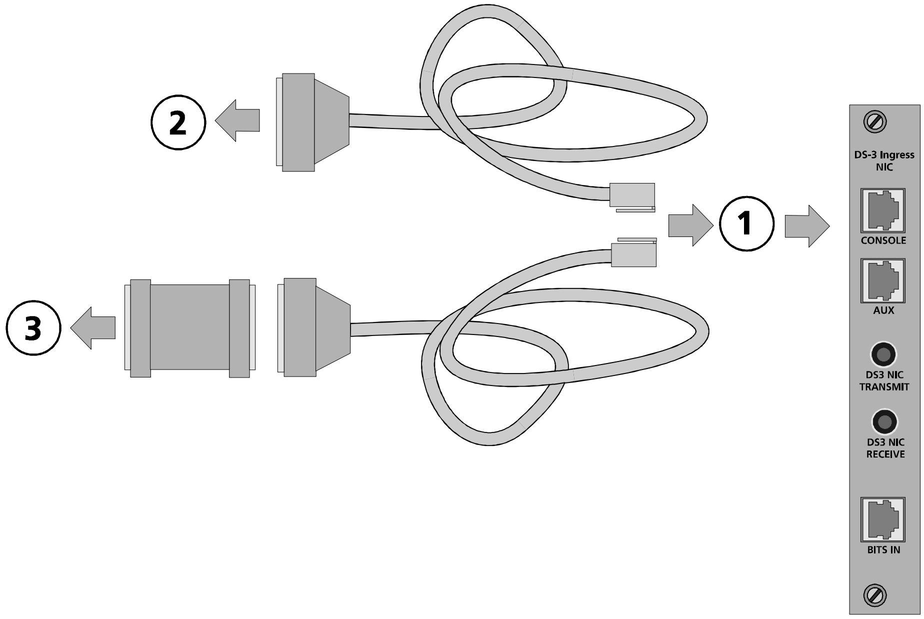


Table 78 describes the various parts of the network cabling diagram.

Table 78 DS-3 Ingress NIC Cabling Diagram Descriptions

Callout Number	Description
1	RJ-45 connector to NIC's console port (9600 baud rate)
2	DB-25 male connector to modem for remote operations
3	DB-25 female-to-female null modem adapter to PC or terminal COM port

Accessing the Terminal Emulation Software

After you have the cables connected, the next step is to run a terminal emulation software package. A familiar one is HyperTerminal.

1 Start a communications application that is capable of sending commands through the computer's serial port. For example, use HyperTerminal on a PC that is running the Windows® operating system.

2 Configure the communications application to use the COM port where the serial cable is connected.

Table 79 lists the configuration settings.

Table 79 DS-3 Ingress Console Port Configuration Settings

Setting	Variable
Port speed	9600 bps (default)
Terminal type	VT100
Data bits	8

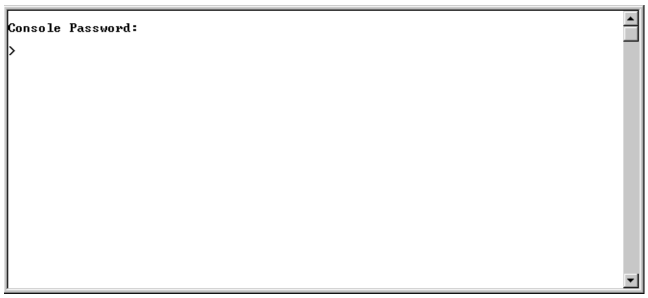
Table 79 DS-3 Ingress Console Port Configuration Settings

Setting	Variable
Parity	None
Stop bits	1
Flow control	None

3 At the terminal screen, type in your login and password.

After you log in the DS-3 Ingress card's CLI **root command prompt** displays.

Figure 172 DS-3 Ingress CLI Login



Configuring DS-3 for T1/PRI Services

Use the following sets of procedures to configure the DS-3 ingress NAC for T1/PRI services. These procedures are intended for initial configuration only. CommWorks has configured new DS-3 ingress cards with the most common line and signaling settings. Simply view the DS3 and DS1 line settings to verify the default card settings. If you need to change the default settings, refer to the *Total Control 1000 Configuration Guide* for detailed configuration information.

Follow these procedures and enter the related commands using the CLI.

You can also configure DS-3 ingress settings through total control manager or common element manager. However, the following procedures only apply to the CLI.

Viewing DS3 Line Settings

Before you begin configuring the DS-3 ingress card, you need to view the current settings to determine if you need to make any adjustments. You can view these settings using common element manager or CLI.

Common Element Manager

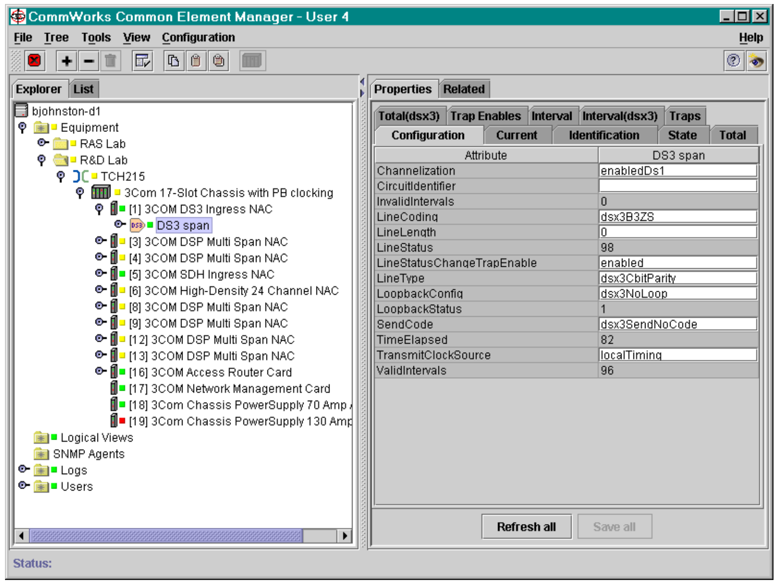
To view DS-3 ingress span settings using the common element manager:

1 Click the DS-3 ingress span to be viewed on the DS-3 ingress card.

2 Click the **Configuration** tab.

The **DS-3 Configuration** window displays showing the current span settings.

Figure 173 Viewing the DS-3 ingress Span Settings



Command Line Interface

To view the current network line settings using the CLI:

1. Access the configuration interface through the CLI.
2. From the root prompt, select the DS-3 ingress card level. Type the following command to switch to the DS-3 ingress card level:

   ```
   > chdev ds3
   ```

   The DS-3 ingress card level prompt appears:

   ```
   ds3 1>
   ```

3. To view DS3 line settings, type the following parameter:

   ```
   ds3 1> display d3conf
   ```

Figure 174 displays the current line settings for the DS3 line.

Figure 174 DS3 Line Settings

```
> chdev ds3
ds3 1> display d3conf
   channelization                    [dsx3Channelization]:  enabledDs1
   circuit identifier             [dsx3CircuitIdentifier]:
   transmit clock source    [dsx3TransmitClockSource]:  local timing
   line coding                          [dsx3LineCoding]:  3 Zero Suppress
   line length (meters)                 [dsx3LineLength]:  0
   ds3 loopback config              [dsx3LoopbackConfig]:  none
   line type                              [dsx3LineType]:  CbitParity
   remote init loopback         [d3iRemoteInitLoopBack]:  ignore
   send code                              [dsx3SendCode]:  send no code
   line status change trap       [ds3LineStatusChangeTE]:  disable

ds3 1>
```

Viewing DS1 Line Settings

Before you begin configuring the DS-1 card, you need to view the current settings to determine if you need to make any adjustments. You can view these settings using common element manager or CLI.

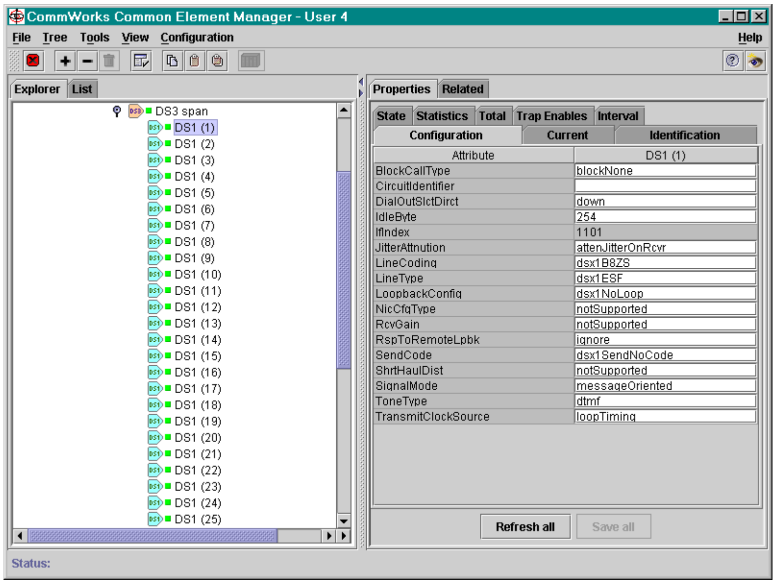
Common Element Manager

To view DS-1 span settings using the common element manager:

1. Click the DS-1 span to be viewed on the DS-3 ingress card.
2. Click the **Configuration** tab.

The **DS-1 Configuration** window displays showing the current span settings.

Figure 175 Viewing the DS-1 Span Settings



Command Line Interface

To view the current network line settings using the CLI:

1 Access the configuration interface through the CLI.

2 From the DS-3 ingress card level prompt, select the desired DS-1 span level. Type the following command, and replace "x" with the desired span level number (e.g., 1-28):

`ds3 1>` **`chdev spanx`**

The span level prompt appears:

`span x>`

3 To view DS-1 span statistics, type the following parameter:

`>` **`display spnstats`**

Figure 176 displays the current span statistics for the DS-1 line.

Figure 176 DS-1 Span Statistics

```
span 1> display spnstats
   Span1 Line Status:
      NO ALARM          = FALSE
      RCV FAR END LOF   = FALSE
      XMT FAR END LOF   = TRUE
      RCV AIS           = TRUE
      XMT AIS           = FALSE
      OUT OF FRAME      = TRUE
      LOSS OF SIGNAL    = FALSE
      LOOPBACK STATE    = FALSE
      T16 AIS           = FALSE
      RCV FAR END LOMF  = FALSE
      XMT FAR END LOMF  = FALSE
      RCV TEST CODE     = FALSE
      OTHER FAILURE     = FALSE
   Span1 Near Time Elapsed:              282 seconds
   Span1 Near Valid Intervals:           96
   Span1 Send Code:                      send no code
   Span1 dsx1 Loopback Configuration:    span no loop

span 1>
```

4 To view DS-1 line status, type the following parameter:

`>` **`display lstatus`**

Figure 177 displays the current line status for the DS-1 line.

Figure 177 DS-1 Line Status

```
span 1> display lstatus
   Span1 Line Status:
      NO ALARM            = FALSE
      RCU FAR END LOF     = FALSE
      XMT FAR END LOF     = TRUE
      RCU AIS             = TRUE
      XMT AIS             = FALSE
      OUT OF FRAME        = TRUE
      LOSS OF SIGNAL      = FALSE
      LOOPBACK STATE      = FALSE
      T16 AIS             = FALSE
      RCU FAR END LOMF    = FALSE
      XMT FAR END LOMF    = FALSE
      RCU TEST CODE       = FALSE
      OTHER FAILURE       = FALSE

span 1>
```

Selecting the Framing Type

You can select the framing type for E1 span settings using either the common element manager, or the CLI.

If you change the framing type for a particular span, save the settings and reboot the card for this change to take effect.

Common Element Manager

To configure framing type using common element manager:

1. Click the DS-3 ingress span to be configured on the DS-3 ingress card.
2. Click the **Configuration** tab.

   The **DS-3 Configuration** window displays showing the current span settings.
3. Double click the drop-down box next to **LineType**, and select the appropriate type of framing for your system.
4. Click **Save All**.

Command Line Interface

To configure framing type using CLI:

1. Access the appropriate span level. Type the following command, and replace "x" with the desired span level (e.g., 1, 2, 3, 4):

   `span1>` **`chdev spanx`**

2. Set the frame type.

   Use Table 80 to set the frame type.

Table 80 DS1 Frame Type Commands

DS1 Frame Type	Command
Extended SuperFrame DS1 (T1/PRI)	set ltype esf
AT&T D4 format DS1 or Super Frame (T1/PRI)	set ltype d4

Table 80 refers to the line type tables found in RFC 1406. Consult RFC 1406 for more information.

Saving the Configuration

When you finish configuring the DSP multispan, save the span and modem settings using either the common element manager or the CLI. For more information on saving configurations, refer to the *Operations Guide*.

Common Element Manager

To save the new configurations using common element manager:

1. Click **Save all** on the Configuration tab window.
2. Right-click the DS-3 ingress card.
3. Select **Save to NVRAM** on the Configuration pop-up list.
4. Right-click the chassis.
5. Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

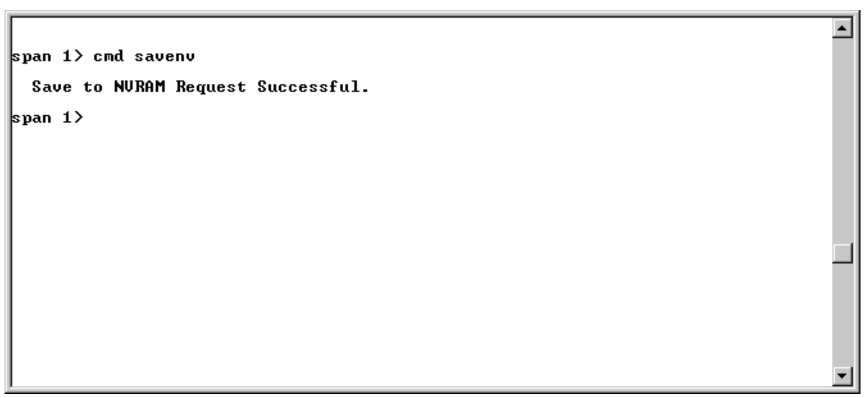
Command Line Interface

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

   span 1> **cmd savenv**

   The system returns the following screen.

   Figure 178 DS3 Line Settings



2. Save the DS3 line configuration by moving to the DS3 line level and entering the following command:

   ds3 1> **cmd savenv**

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

```
> reboot
```

Testing the Configuration

After you have configured your DS-3 ingress card to meet your environment's requirements you need to test the configuration. You can test this using either the common element manger or the CLI.

Common Element Manager

To test the new configurations using CLI:

1. Use a telephone to dial into a number on the span.
2. Right-click the DS-3 span on the DS-3 ingress card.
3. Select **Monitor State** from the drop-down list.

   The Monitor State window appears.
4. Select the State and Class from the drop-down lists that you want to monitor for a real time display.

Command Line Interface

To test the new DS-3 and DS-1 line configurations using CLI:

1. From the DS-3 card level prompt, select the desired DS1 span level. Type the following command, and replace "x" with the desired span level number (e.g., 1-28):

   ```
   ds3 1> chdev spanx
   ```

   The span level prompt appears:

   ```
   span x>
   ```
2. To view DS1 span statistics, type the following parameter:

   ```
   > display spnstats
   ```
3. To view DS1 line status, type the following parameter:

   ```
   > display lstatus
   ```
4. Move to DS3 line level

   ```
   > chdev ds3
   ```
5. From the DS3 line level, enter the following command to display the line status for the DS3 line:

   ```
   ds3 1> display d3lstatus
   ```

VI SDH STM-0 CARD

Chapter 21 SDH STM-0 Card Overview

Chapter 22 Installing the SDH STM-0 Card Set

Chapter 23 Initial Configuration—SDH STM-0 Card

21 SDH STM-0 CARD OVERVIEW

This chapter provides an overview of the SDH (Synchronous Digital Hierarchy) STM-0 (Synchronous Transport Module, level 0) card set. The card set contains the Network Interface Card (NIC) and the Network Application Card (NAC).

This chapter contains the following topics:

- Product Description
- Hardware Standards

Product Description

This section describes the SDH STM-0 NAC, including system overview, hardware standards, applications and physical interfaces.

Introduction

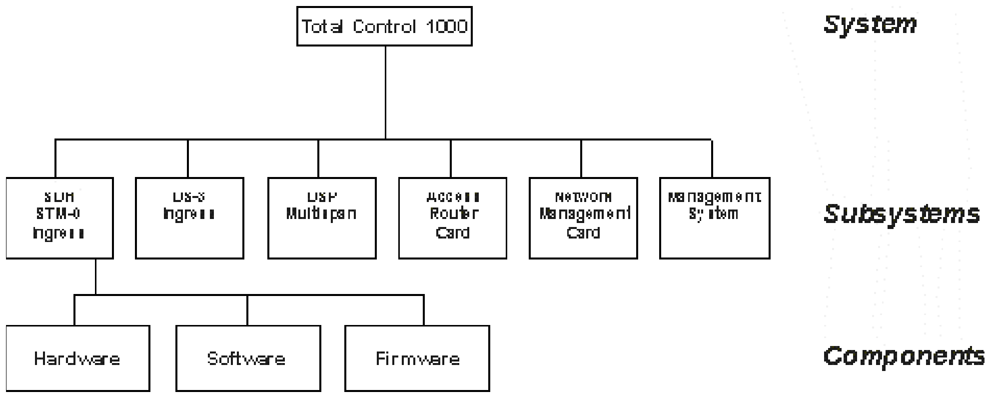
SDH 1.0 is an SDH-enabled Total Control® 1000 Enhanced Data System. In general, the Total Control 1000 enhanced data system is a powerful data communications platform that can support a broad variety of applications. The applications that can be accommodated are governed by front-loaded NACs and rear-loaded NICs that are installed in the chassis midplane.

System Components

SDH 1.0 includes the following subsystem modules and components:

- SDH STM-0 ingress module—SDH STM-0 NAC and NIC
- DS-3 ingress module—DS-3 ingress NAC and NIC
- Modem module—DSP multispan NAC only
- Router & LAN/WAN Egress module—Access router card and associated NIC; includes Common Element Manager software application
- Management module—Network Management Card and associated NIC
- Management software—Total Control Manager and Common Element Manager allows you to download software and configure most settings for the different card sets.

Figure 179 System Diagram



As shown in Figure 179, the SDH STM-0 module contains three interrelated components: hardware, software, and firmware. These components seamlessly work together to allow the SDH STM-0 subsystem to communicate effectively and operate successfully within the Total Control 1000 system.

Hardware Standards

The SDH STM-0 module contains a front-loaded SDH STM-0 NAC and a rear-loaded SDH STM-0 NIC. The SDH STM-0 NAC provides WAN ingress options for the DSP multispan modem system.

The SDH STM-0 NAC terminates a Sychronous Transport Module (STM-0) over an OC-1 optical fiber interface, de-maps 28 VC-11 mapped DS-1 signals, and multiplexes the 28 DS-1 signals into one DS-3 stream. The data then travels out through an external DS-3 cable from the SDH STM-0 NIC to the DS-3 NIC.

The DS-3 ingress NIC receives DS0 ingress signals (up to 672) through the single DS-3 line and passes this data to the DS-3 ingress NAC across a proprietary serial interface. These calls are terminated on DSP multispan modems. Once the modem processing is complete, the DSP multispan NAC passes the data across the packet bus to the access router card. The access router card performs encryption and standard routing functions.

Applications

The SDH STM-0 module performs the following applications:

- STM-0 Support
- SDH - DS-3 Conversion
- Redundancy

STM-0 Support

The SDH STM-0 module provides SDH OC-1 optical fiber ingress to the Total Control 1000 system from an SDH Public Switched Telephone Network (PSTN).The SDH STM-0 module converts one SDH STM-0 framing signal into one DS-3 span over an OC-1 optical fiber interface.

The SDH STM-0 module is not compatible with SONET framing standards.

SDH - DS-3 Conversion

The primary function of the SDH STM-0 module is STM-0/DS-3 conversion. Therefore the SDH STM-0 module does not operate without the presence of a fully-functional DS-3 ingress module.

The SDH STM-0 NAC terminates one OC-1 optical fiber line. During STM-0/DS-3 conversion, an STM-0 converter within the SDH STM-0 NAC converts the STM-0 framing to one DS-3 span. The SDH converter then passes the DS-3 span through an external DS-3 coax cable to a DS-3 ingress NIC in the Total Control 1000 chassis.

Redundancy

Redundancy is the capability of having one or more backup modules available in case of a failure of the main module. SDH 1.0 requires redundancy for the entire STM-0 span through an internal switching device known as Automatic Protection Switching (APS). Refer to the next chapter for chassis configuration rules concerning redundancy. Refer to the *SDH 1.0 Product Reference* for detailed information regarding redundancy and APS.

External Interfaces

The following section provides information regarding the SDH STM-0 card set physical interfaces.

SDH STM-0 Front Panel Interfaces

Figure 180 shows the SDH STM-0 NAC physical interfaces.

Figure 180 SDH STM-0 NAC Physical Interfaces

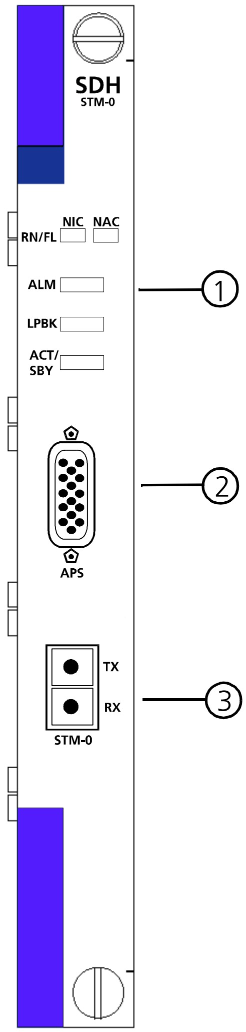


Table 81 refers to the callouts in Figure 180.

Table 81 SDH STM-0 NAC Front Panel Interfaces

Callout	Interface
1	Run/Fail NAC Status LED Indicator
	Run/Fail NIC Status LED Indicator
	Alarm Status LED Indicator
	Loopback Status LED Indicator
	Active/Standby Status LED Indicator
2	APS Connection
3	STM-0 Transmit and Receive Ports

Status LED Indicators The SDH STM-0 NAC front panel contains five Light Emitting Diode (LED) indicators that are useful for locating and monitoring problems. The status LEDs located at the top of the front panel may be off, red, green or amber, and are used to indicate status within a chassis environment. Refer to the Trouble Locating and Clearing appendix for more information.

APS Connection A proprietary Automatic Protection Switching (APS) cable is provided. This cable is required to facilitate switching between the active SDH STM-0 card and the standby SDH STM-0 card.

STM-0 Ingress Port The STM-0 ingress port is comprised of one receive and one transmit port, each of which uses an MU style connector. One STM-0/OC-1 optical fiber cable connects to each port.

SDH STM-0 Back Panel Interfaces

Figure 181 shows the SDH STM-0 NIC physical interfaces.

Figure 181 SDH STM-0 NIC Physical Interfaces

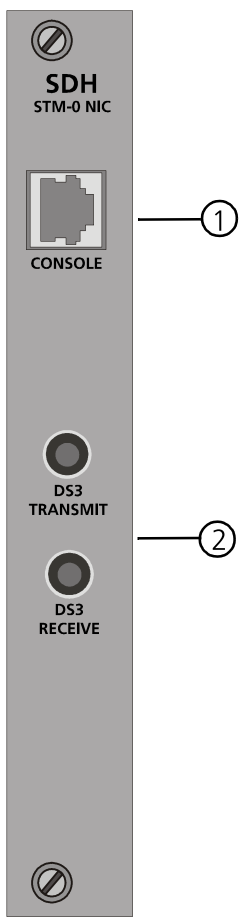


Table 82 refers to the call outs in Figure 181.

Table 82 SDH STM-0 NAC Physical Interfaces

Interface	Description
Console Port	The RS-232 Console Port has a standard RJ-45 connector located on the SDH STM-0 NIC. This port is used for local configuration and software download through the CommWorks character-based, menu-driven user interface (Command Line Interface).
DS-3 Transmit/Receive	The SDH STM-0 NIC transmits DS-1 span signals to the DS-3 ingress NIC through one 44.736 Mbps B3ZS encoded serial stream traveling on provided DS-3 cables.

22 INSTALLING THE SDH STM-0 CARD SET

This chapter contains the installation requirements, procedures, and verification for the SDH STM-0 card set. The card set contains the Network Interface card (NIC) and the Network Application Card (NAC).

This chapter contains the following topics:

- Chassis Card Placement
- Installation Procedure
- Cabling Instructions
- Installation Verification

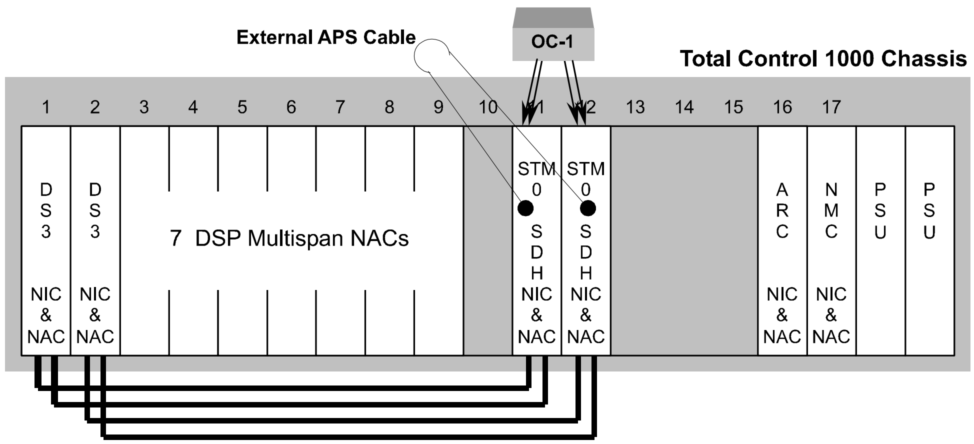
WARNING: *Before installing the SDH STM-0 NAC in a Total Control® 1000 chassis, the corresponding SDH STM-0 NIC must be installed and cabled.*

Chassis Card Placement

The SDH STM-0 module provides redundancy for the entire STM-0 span through Automatic Protection Switching (APS). SDH 1.0 is a redundant system, containing two SDH STM-0 modules and two DS-3 ingress modules.

The following diagram and configuration procedures illustrates the CommWorks Total Control 1000® chassis configuration with the SDH STM-0 modules, supporting ingress redundancy and APS. Refer to the *SDH 1.0 Product Reference* for configuration information regarding redundancy and APS.

Figure 182 SDH 1.0 Chassis Installation



Installation Sequence

The Total Control 1000 chassis contains front-loaded NACs and rear-loaded NICs.

To install the Total Control 1000 SDH 1.0 System, follow the set of procedures below.

WARNING: *Before installing the SDH STM-0 NAC in a Total Control 1000 chassis, the corresponding SDH STM-0 NIC must be installed and cabled.*

1. Install one DS-3 ingress NIC/NAC card set (module) in slot 1.
2. Install one DS-3 ingress NIC/NAC module in slot 2.
3. Install one DSP multispan NAC in slot 3.

CAUTION: *For SDH 1.0, you do not use any DSP multispan NICs. Cover the open spaces with blank panels to assure safety.*

4. Install one DSP multispan NAC in slot 4.
5. Install one DSP multispan NAC in slot 5.
6. Install one DSP multispan NAC in slot 6.
7. Install one DSP multispan NAC in slot 7.
8. Install one DSP multispan NAC in slot 8.
9. Install one DSP multispan NAC in slot 9.

10 Slot 10 is reserved.

11 Install one SDH STM-0 NAC/NIC module in slot 11.

12 Install one SDH STM-0 NAC/NIC module in slot 12.

13 Reserve slot 15 for an additional Access Router Card NAC/NIC module (optional).

14 Install the access router card NAC/NIC module in slot 16.

15 Install the Network Management Card NAC/NIC module in slot 17.

Installation Procedure

The installation procedure is the same for both NIC and NAC cards except where noted. The NIC is installed in the back of the chassis and the NAC is installed in the front of the chassis.

ESD: To reduce the risk of electrostatic discharge (ESD), take proper grounding precautions before handling the NAC.

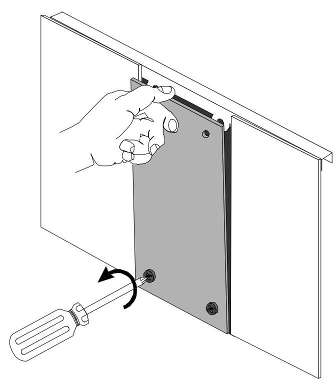
Install the NAC with or without power applied to the chassis.

To install the SDH STM-0 card set:

WARNING: *The NIC must be installed before the NAC is installed.*

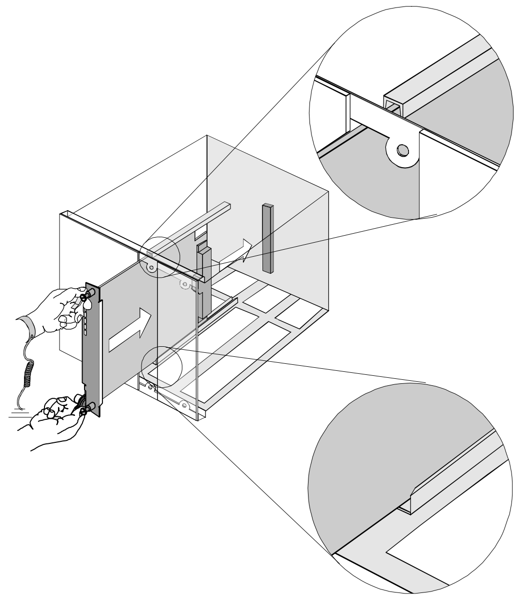
1 Use a #2 Phillips screwdriver to remove the safety panel covering this slot.

Figure 183 Removing the Safety Panel



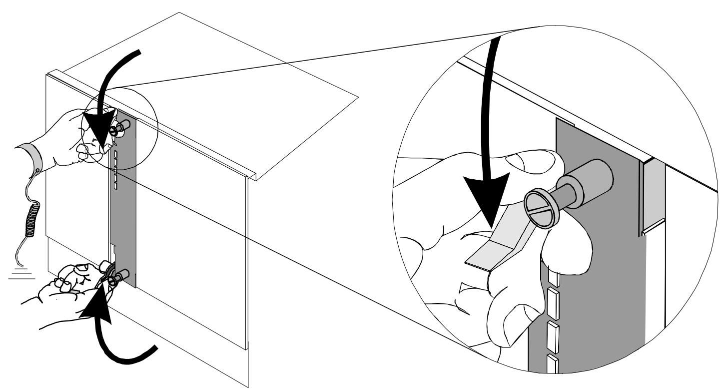
2 Insert the card between the slot's upper and lower card guides.

Figure 184 Inserting the SDH STM-0 Network Application Card



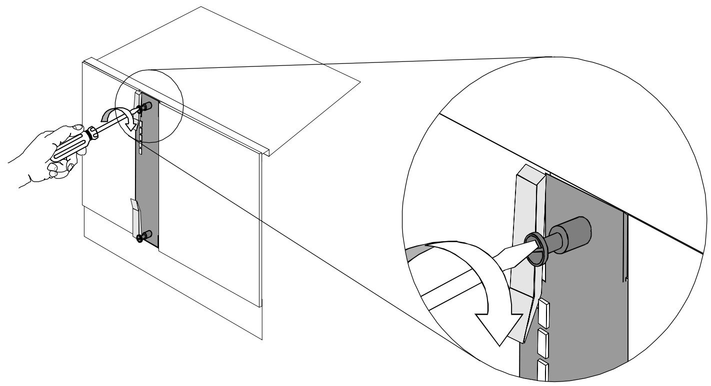
3 Holding the tabs perpendicular to the panel, slide the card into the chassis, until the front of the Card is flush with the chassis. Push the tabs toward each other to secure the card.

Figure 185 Securing the SDH STM-0 Network Application Card



4 Use a slotted screwdriver to tighten the screws on the front panel.

Figure 186 Tightening the Front Panel Screws



5 Install all other modules in the Total Control 1000 chassis. Refer to the previous section, Chassis Card Placement, for a list of configuration rules.

Refer to the appropriate chapters for installation procedures relating to the other modules in the Total Control 1000 chassis (i.e., network management card, access router card, DSP multispan, and DS-3 ingress). See the About This Guide chapter for appropriate part numbers and manual title information.

6 Cover any unused chassis slots with safety panels.

7 Refer to the next section for detailed cabling instructions relating to the SDH STM-0 NAC and SDH STM-0 NIC.

Cabling Instructions

Once you have installed all of the necessary modules in your SDH 1.0 chassis, you are ready to cable the cards. The following instructions are related to the SDH STM-0 module, its redundant partner, and the two DS-3 ingress modules only.

For the following procedure, you need one CommWorks proprietary APS cable and four standard DS-3 cables. CommWorks provides these cables for you. However, CommWorks does not provide OC-1 optical fiber cables. Obtain these cables from your local telephone exchange carrier.

CAUTION: *We recommend that you turn the chassis power off before cabling the SDH 1.0 modules.*

CAUTION: *Following this cabling procedure ensures the most reliable APS switching. Failure to do so may result in a higher threshold of error indications being sent to the external switch. Refer to the Trouble Locating and Clearing appendix in the* SDH 1.0 Product Reference *for detailed information regarding errors.*

1 Use one DS-3 cable to connect from the DS-3 Transmit port on the SDH STM-0 NIC located in slot 11 to the DS-3 Receive port on the DS-3 ingress NIC located in slot 1.

2 Use a second DS-3 cable to connect from the DS-3 Receive port on the SDH STM-0 NIC located in slot 11 to the DS-3 Transmit port on the DS-3 ingress NIC located in slot 1.

3 Use a third DS-3 cable to connect from the DS-3 Transmit port on the SDH STM-0 NIC located in slot 12 to the DS-3 Receive port on the DS-3 ingress NIC located in slot 2.

4 Use a fourth DS-3 cable to connect from the DS-3 Receive port on the SDH STM-0 NIC located in slot 12 to the DS-3 Transmit port on the DS-3 ingress NIC located in slot 2.

5 Connect the CommWorks proprietary APS cable from the APS port on the SDH STM-0 NAC located in slot 11 to the APS port on the SDH STM-0 NAC located in slot 12.

6 Connect the transmit OC-1 optical fiber cable from Side 0 on the SDH telephone switch to the receive STM-0 port on the SDH STM-0 NAC located in slot 11.

7 Connect the receive OC-1 optical fiber cable from Side 0 on the SDH telephone switch to the transmit STM-0 port on the SDH STM-0 NAC located in slot 11.

8 Connect the transmit OC-1 optical fiber cable from Side 1 on the SDH telephone switch to the receive STM-0 port on the SDH STM-0 NAC located in slot 12.

9 Connect the receive OC-1 optical fiber cable from Side 1 on the SDH telephone switch to the transmit STM-0 port on the SDH STM0 NAC located in slot 12.

10 Apply power to the chassis if power is not already applied.

Installation Verification

Verify installation by observing the LEDs after installing and powering the SDH STM-0 NAC and corresponding SDH STM-0 NIC.

Network Application Card Verification

To verify the installation of the SDH STM-0 NAC:

- The Run/Fail NAC LED on the SDH STM-0 NAC should be solid green.
- The Run/Fail NIC LED on the SDH STM-0 NAC should be solid green
- If the Run/Fail NAC or Run/Fail NIC LEDs do not light, or are solid red or flashing red, there is an error. Refer to the "Trouble Locating and Clearing" appendix for more information.

Network Interface Card Verification

Once the SDH STM-0 NAC is installed, the Run/Fail NIC LED on the SDH STM-0 NAC should be solid green. Refer to the Trouble Locating and Clearing appendix for more information.

23 INITIAL CONFIGURATION—SDH STM-0 CARD

This chapter provides instructions for accessing the configuration interface of the SDH STM-0 ingress Network Application Card (NAC). You can download software and configure/monitor SDH STM-0 settings locally through the SDH STM-0 NIC Console Port or remotely through Common Element Manager or total control manager.

This chapter explains how to establish both a local network connection and a remote network connection to the SDH STM-0 NAC's interface. It also contains the procedures to configure the DS-3 Ingress card for SDH STM-0 support.

This chapter contains the following topics:

- Setting Up a Local Network Connection
- Setting the DS-3 Ingress Card for SDH STM-0 Support

For detailed installation and initial configuration instructions using Total Control Manager, please refer to the *Total Control Manager for Windows and UNIX Getting Started Guid*e.

The SDH STM-0 NAC is configured with factory default settings. You do not need to change any parameter settings for the SDH STM-0 module to operate properly. Please refer to the SDH 1.0 Product Reference *for detailed description of configuration parameters.*

Setting Up a Local Network Connection

This section contains procedures for running terminal emulation software to access the command line interface menu locally. For information on configuring the SDH STM-0 card remotely, refer to the *Modem and Span Command Line Interface Reference*.

If you are not going to use the Command Line Interface (CLI) you can proceed to the next step.

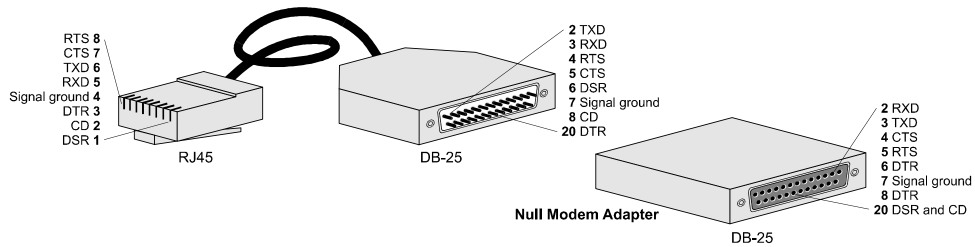
Before accessing the SDH STM-0's CLI through the console port, you must establish a local network connection to the SDH STM-0 module.

To establish a local network connection to the SDH STM-0 module:

1. Connect the DB-25 end of the serial cable described in Figure 187 to the null modem adapter that was supplied with the SDH STM-0 module.

2 Connect the RJ-45 end of the serial cable described in Figure 187 to the console port on the SDH STM-0 NIC. The console port is closest to the top of the NIC.

Figure 187 Serial Cable Connection



3 Connect the null modem adapter directly to a serial port on your computer, or into an RS-232 cable connected to a serial port on your computer.

4 On your computer, start a communications application that is capable of sending commands to your computer's serial port. A common application is HyperTerminal for Windows.

Windows HyperTerminal (included with Microsoft Windows 95/98) and Procomm Plus are popular communications software applications which support VT100 terminal emulation for IBM-PC compatible computers.

Kermit, minicom and tip are typical terminal emulation programs for UNIX-based computers. Depending on the platform you're using, you may need to modify a configuration file for VT100 settings.

5 Configure the communications application to use the COM port where the serial cable is connected.

Table 83 lists the configuration settings.

Table 83 SDH STM-0 Console Port Configuration Settings

Setting	Variable
Port speed	115200 bps (default)
Terminal type	VT100
Data bits	8
Parity	None
Stop bits	1
Flow control	None

6 Initiate the terminal connection.

7 Power on the unit. After a few moments, when your screen has registered system initialization, loaded the kernel and enabled a number of processes, the Boot Configuration menu appears. After a few seconds, the CLI will time out and default to the SDH STM-0 configuration menu.

Setting the DS-3 Ingress Card for SDH STM-0 Support

You must configure the DS-3 Ingress card for SDH STM-0 support. You can use either common element manager or CLI.

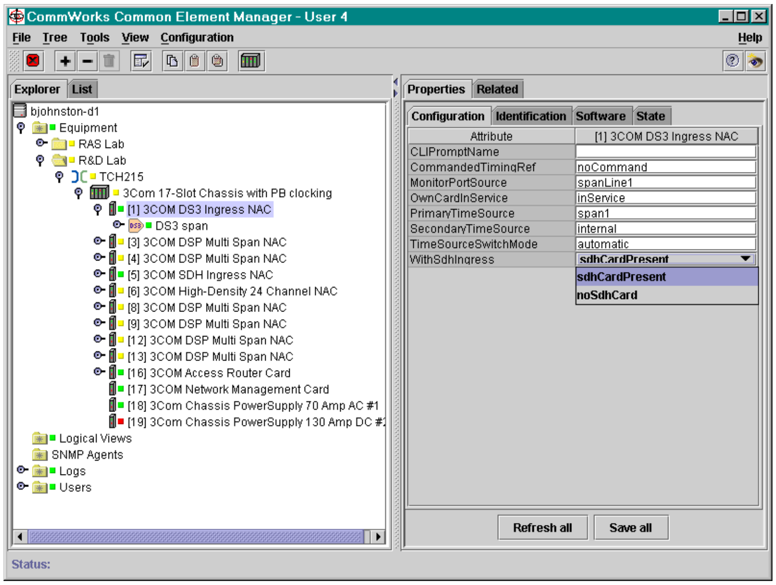
Common Element Manager

To configure the DS-3 ingress card for SDH STM-0 support using the common element manager:

1. Click the DS-3 ingress card.
2. Click the **Configuration** tab.
3. Double-click the **WithSdhIngress** field on the Configuration tab.

   The **WithSdhIngress** configuration drop-down list appears.

   Figure 188 Configuring DS-3 Ingress Card for SDH STM-0 Support



4. Select **sdhCardPresent**.
5. Click **Save All**.
6. Right-click the DS-3 ingress card.
7. Select **Save to NVRAM** on the Configuration pop-up list.
8. Right-click the chassis.
9. Select **Rediscover**.

This function may take a few minutes and should only be done when you are finished making all of your changes to the cards on the chassis

No additional configuration is required for the SDH STM-0 card or the DS-3 card for SS7 support.

Command Line Interface

To view the current network line settings using the CLI:

1 Access the configuration interface through the CLI.

The card's defaults must be in place. No overrides are allowed.

From the DS-3 Ingress CLI:

1 Enter this command from any command level prompt:

`chdev card`

The card level command prompt appears:

`card>`

2 Enter this command from the card level command prompt:

`set d3wsdh yes`

3 Save the new configuration to flash memory by entering this command from any command level:

`cmd savenv`

4 Reboot the DS-3 Ingress card by entering this command from any command level:

`reboot`

No additional configuration is required for the SDH STM-0 card or the DS-3 card for SS7 support.

VII

APPENDICES

Appendix A Trouble Locating and Clearing

Appendix B Technical Specifications

Appendix C Configuration Tables

A TROUBLE LOCATING AND CLEARING

This appendix contains situations which you may encounter while performing your initial setup and configuration.

This appendix contains the following topics:

- Fan Failure
- Power Failure Diagnostics
- Network Management Card
- Access Router Card
- DSP Multispan Card
- SS7 and the DSP Multispan
- SS7 and the Access Router Card

For a complete guide to trouble shooting, refer to the *Trouble Locating and Clearing Guide*.

Fan Failure

If the fan tray should stop operating, make sure the chassis receives proper ventilation immediately.

Check to make sure the power is still on and is being supplied to the tray. Refer to Power Failure Diagnostics for more information.

With correct ventilation and properly operating fan tray, a chassis network management card should report a temperature readout about 25 degrees Celsius. Sites with temperature readouts above 35 degrees Celsius should be inspected for correct room temperature and operating fan trays as reading above 39 degrees Celsius (104 degrees Fahrenheit) may cause equipment failures or intermittent problems.

Power Failure Diagnostics

This section describes possible causes of power failure, power supply problem diagnosis, and trouble locating and clearing actions.

Causes of Failure

Power supply unit (PSU) failure may be caused by any of the following conditions:

- Input voltage failure
- Internal power supply fuse failure
- Internal power supply failure
- Input voltage out of specification (for example, too low)

Power supply units in the Total Control 1000 chassis are fully short-circuit protected. If there is a current overload sensed at the power supply output terminals, the power supply automatically shuts down until the fault is corrected. Once it is corrected, the power supply automatically comes back on.

If a PSU/PSI RN/FL (RUN/FAIL) light-emitting diode (LED) is red, the procedures described in this chapter should enable you to diagnose the cause of the problem.

Diagnosing Power Supply Problems

Each PSU and PSI has an LED that indicates if power is on. The PSU has an additional LED indicating operational status of the PSI.

LED Errors

With the power on, check the PSU and PSI RN/FL (RUN/FAIL) for any of the following indications:

If the LED is showing no indicator light:

- Improper installation:
  - Check cabling and power switch position
  - Remove PSU and reinstall
- Input voltage failure:
  - Test voltage source

If the LED is showing solid red or flashing red:

- Improper installation:
  - Check cabling
  - Remove PSU and reinstall
- Input voltage out of spec:
  - Test input voltage

- Overload condition:
  - Remove the Network Interface Cards (NICs) and the Network Application Cards (NACs) one at a time to determine if one is causing the overload.

Trouble Clearing Steps

If any of the above indications occur, use the following instructions.

1. Remove and reinstall the PSI/PSU set that has a red LED. Follow the procedures in Chapter 3, Installing and Removing Power Supplies located in this guide. This action resets the power supply cards.

WARNING: *Observe the warnings on the chassis concerning shock and hot component hazards.*

2. Check to see if the Run/Fail indicators on the PSU front panel are now green.

   The problem may be minor, causing the unit to reset. If this is not the case, completely remove the faulty PSU and PSI, and contact CommWorks Systems Professional Services.

Power Supply Overvoltage

If overvoltage is sensed at the output terminals, the power supply immediately shuts down.

If this happens:

1. Remove the PSU and the PSI where the LED is flashing. (Follow the procedures in Chapter 3, Installing and Removing Power Supplies.)
2. Plug the cards back in to recycle the power.

WARNING: *Be careful to observe possible shock hazards and touching hot components.*

3. Reinsert the unit and check the Run/Fail indicator on the PSU front panel and/or PSI rear panel.

If the card does not reset, remove the faulty PSU/PSI cards and contact CommWorks Professional Services.

Overload Conditions

Check for a modem or interface unit failure that may be causing an overload condition. Remove each modem and NIC one at a time, until the power supply indicator lights. The last modem or interface unit removed is probably the cause of the overload condition.

Network Management Card

The following section details problems and possible solutions that may occur during installation and initial configuration of the network management card set.

At power-up, the Light Emitting Diodes (LEDs) located on the card's front panel is solid red for a short time. This is a normal condition.

Table 84 lists network management card Network Application Card (NAC) trouble clearing information for problems occurring at power-up. This information relates to Local Area Network (LAN) and Wide Area Network (WAN) connections.

Table 84 Network Management Card Power Up Diagnostics

LED	Description	Status	Meaning
A	Run/Fail (RN/FL)	Solid green	Normal/diagnostics mode/boot-up self-test
		Solid red	Critical Failure
		Flashing red/green	Non-critical failure on initial power-up
		Flashing green	Testing or software download (required or in process). Also during boot-up sequence
B	Hub access	Solid green	Chassis normal/diagnostics mode
		Solid red	Chassis critical failure
		Flashing red	Management bus failure with card in chassis
C	LAN TX	Green OFF	Network Management Card transmitting data on LAN port No data being transmitted on LAN port
D	LAN RX	Green OFF	Network Management Card receiving data on LAN port No data being received on LAN port
E	WAN TX	Green OFF	Network Management Card transmitting data on WAN port No data being transmitted on WAN port
F	WAN RX	Green OFF	Network Management Card receiving data on WAN port No data being received on WAN port

Table 85 lists information on trouble clearing power-up problems with the network management card RN/FL LEDs.

Table 85 Network Management Card LED Conditions

After power-up is complete, if the RN/FL LED is	Then	Take this action
solid green	The condition is normal	No action required.
solid red	There is a critical failure	Remove and reinstall the network management card.

Table 85 Network Management Card LED Conditions (continued)

After power-up is complete, if the RN/FL LED is	Then	Take this action
flashing red and green	The NIC has not been properly installed	Remove the NIC and reseat the card in the chassis. Note: If the NIC is installed after the network management card, reboot the network management card by removing and reseating the network management card.
not lit	There is no power to the NAC	Make sure the network management card is installed properly. Make sure the chassis is powered on. Make sure the RN/FL LED is green.

At power-up, the LEDs is solid red for a short time. This is a normal condition.

When a PING does not respond

If a PING procedure does not respond, observe the LEDs on the network management card. If you are using a LAN connection, use the LAN RX and LAN TX LEDs. If you are using a SLIP connection, use Table 86 to determine the WAN RX and WAN TX LEDs.

Table 86 WAN RX and WAN TX LED Display

Tx LED colors	Rx LED colors	Indicates
Flashing green	Flashing green	Normal - no failures
No LEDs lit	No LEDs lit	There is a bad physical connection. Reinstall the network management card NAC. ■ **SLIP —** PC COM port may be addressed incorrectly ■ **LAN —** If you are using a NAC, the PC COM port may be addressed incorrectly
No LEDs lit	Flashing green	The PING may be reaching the network management card, but the IP address is incorrect. Be sure the IP address for the PING matches the address set within the network management card User Interface (UI). The baud rate may be incompatible. ■ **SLIP —** You may be trying to use a baud rate greater than 19.2 kbps with a PC COM port that uses an 8250 UART. Use a 16550 UART for higher speed connections.

Critical Failure Debug Procedure

Follow this procedure if you suspect a critical failure at start-up.

1 Pull the network management card NAC forward to unplug it from the midplane.

2 Plug the card back into the midplane. Check to see if the RN/FL LED becomes green. If this did not solve the problem, call Commworks Professional Services.

Power Up Problems

Table 87 lists network management card NAC trouble clearing information for problems occurring at power-up. This information relates to Local Area Network (LAN) and Wide Area Network (WAN) connections.

Table 87 Network Management Card Diagnostics

LED	Description	Status	Meaning
A	Run/Fail (RN/FL)	Solid green	Normal/diagnostics mode/boot-up self-test
		Solid red	Critical Failure
		Flashing red/green	Non-critical failure on initial power-up
		Flashing green	Testing or software download (required or in process). Also during boot-up sequence
B	Hub Status	Solid green	Chassis normal/diagnostics mode
		Solid red	Chassis critical failure
		Flashing red	Management bus failure with card in chassis
C	LAN TX	Green OFF	network management card transmitting data on LAN port No data being transmitted on LAN port
D	LAN RX	Green OFF	network management card receiving data on LAN port No data being received on LAN port
E	WAN TX	Green OFF	network management card transmitting data on WAN port No data being transmitted on WAN port
F	WAN RX	Green OFF	network management card receiving data on WAN port No data being received on WAN port

At power-up, the LEDs located on the card's front panel is solid red for a short time. This is a normal condition.

LED RN/FL Lights

Table 88 lists the possible reason for the Run/Fail LED lights to occur during initial configuration.

Table 88 Installation LED Errors

Trouble Locating	Possible Cause	Trouble Clearing
RN/FL LED is showing no indicator light	Improper installation	Remove NAC and reinstall it.
RN/FL LED is solid red	Improper installation	Remove NAC and reinstall it.
RN/FL is flashing red	The NAC did not detect a Network Interface Card (NIC)	Reinstall the NIC directly behind the NAC.

Miscellaneous Information

Table 89 lists miscellaneous trouble locating and clearing information for the network management card initial configuration.

Table 89 Initial Configuration Errors

Trouble Locating	Possible Cause	Trouble Clearing
Cannot PING the access router card	Cable disconnected	Check the cable connection. Check the RN/FL LED for connectivity - the LED should appear green.
No response from the terminal emulation program.	Incorrect DIP switch setting	Refer to Network Management Card Overview for more information.
No Ethernet connection	Link is administratively down or misconfigured	Use the following CLI commands to check the interface and IP connection: list interfaces list ip networks

Access Router Card

The following section details problems and possible solutions that may occur during installation and initial configuration of the access router card set.

Network Interface Card

Table 90 lists Ethernet port LEDs and provides trouble locating and clearing information.

Table 90 Ethernet Port LEDs Diagnostics

LED	Trouble Locating	Trouble Clearing
Link	Green	Valid Ethernet connection
	None	No Ethernet connection detected; to get an Ethernet connection, check the: ■ User interface console port cabling ■ Cable for damage ■ Power
TX/RX	Flashes Green	Receiving data
	Flashes Yellow	Transmitting data
	None	No activity

The Ethernet port must be configured properly in order to transmit and receive data. The NAC's user interface (UI) console has status screens that supply information on power-up self tests and card status.

Network Application Card

Table 91 lists problems and possible solutions that may occur during initial installation.

Table 91 Installation LED Errors Diagnostics

Trouble Locating	Possible Cause	Trouble Clearing
RN/FL LED is showing no indicator light	Improper installation	Remove NAC and reinstall it.
RN/FL LED is solid red	Improper installation	Remove NAC and reinstall it.
RN/FL is flashing red	The NAC did not detect a Network Interface Card (NIC)	Reinstall the NIC directly behind the NAC. Refer to the NIC's Getting Started Guide for more information.

Table 92 lists problems and possible solutions that may occur during initial configuration.

Table 92 Initial Configuration Errors

Trouble Locating	Possible Cause	Trouble Clearing
Cannot PING the Access Router Card	Cable disconnected	Check the cable connection. Check the RN/FL LED for connectivity - the LED should appear green.
No Ethernet connection	Link is administratively down or misconfigured	Use the following CLI commands to check the interface and IP connection: list interfaces list ip networks

Table 93 lists possible problems on the network application card and their resolution.

Table 93 Access Router Card Errors

Trouble Locating	Possible Cause	Trouble Clearing
Cannot connect to access router card	Wrong DIP switch setting	Check access router card DIP switches.
Cannot connect to access router card through the Console Port	Wrong terminal program settings	Check the terminal program settings such as baud rate speed.

Table 93 Access Router Card Errors (continued)

Trouble Locating	Possible Cause	Trouble Clearing
Run/Fail LED does not light up	Access router card is not properly installed Access router card is not getting power from the chassis The Run/Fail LED may be defective	Ensure that the access router card is plugged into a valid chassis slot (not slot 17). Ensure that the access router card is getting power from the chassis: Check the +5V power path by ohming out F3 Check the +12V and -12V power path by ohming F2 and F1 respectively Check the softstart circuit using a voltmeter Check 3.3V and 2.05V on C459 and C596 respectively Run the board and examine the console port for defective LEDs.
Cannot view Checkpoint values	Checkpoint Debug Board	The access router card had a Checkpoint header (J7) which requires a Checkpoint Debug Board with dual seven segment LEDs to view the checkpoint values.
Access router card does not boot; the Run/Fail LED is red	The card is not properly connected to the chassis midplane The BIOS (U29) may be corrupted The PCISC (U4) may not be loaded properly from ROM (U470)	Verify the seating of the board in the midplane. Check the midplane connector for bent or missing pins. After powering up your chassis, check pin 4 of RP21 for active low signal on FLASH_CE0.

Table 93 Access Router Card Errors (continued)

Trouble Locating	Possible Cause	Trouble Clearing
Run/Fail LED remains red and the CPU is not active	Components may not be properly connected to the CPU, PCI, or peripheral address and data busses	Verify the activity of the CPU by checking TS signals (U12-L15). Reboot and see if there is any TS signal. If you detect a TS signal: ■ Check the components visually connected to the CPU address and data busses. ■ Check the components visually connected to the PCI address/data bus. ■ Check the components visually connected to the peripheral address and data busses. ■ Check the contents of the BIOS ROM. If you do not detect a TS signal: ■ The CPU is not doing anything. Check the 3.3V and 2.05V power supplies. Visually check the component values and inspect the voltage regulatory circuitry for problems. ■ If the power supplies are functional, check the CPU clock, 60X_CLK. Visually inspect the clock generation circuit for problems. ■ If the CPU clock is working properly, check the reset to the CPU at U15. Check both the reset/supervisor circuitry and the PCISC auto-load circuitry for problems. Visually inspect these component areas and use an oscilloscope as necessary.

If any of these problems persist, contact CommWorks technical support at the number listed in About This Guide.

DSP Multispan Card

Table 94 lists problems and possible solutions that may occur during installation and initial configuration of the DSP multispan card set.

Table 94 Initial Configuration Errors

Physical State	Carrier LED State	Alarm LED State	Loop-back LED State	Alarm/ Error	Diagnosis/Trouble Clearing
F1	Green	Off	Off	No Alarm	
F2	Red	Off	Off	Yellow Alarm Remote Frame Alarm	The remote end has lost the DSP multispan NAC's framing or signal and sends this alarm to the DSP multispan NAC.
F3	Off	Red	Off	Red Alarm Loss of Signal	The received T1 or E1 signal has been lost. The DSP multispan NAC declares a red alarm and sends a yellow alarm to the remote end.
F4	Off	Red	Off	Red Alarm Out of Frame	The received T1 or E1 framing has been lost and the framed payload can no longer be received. The DSP multispan NAC declares a red alarm and sends a yellow alarm to the remote end.
F5	Green	Red	Off	Blue Alarm Unframed all ones	The remote end is sending out an all ones signal. This is usually done when the remote end can not send out a framed signal.
F6	Green	Red	Off	Blue Alarm Unframed all ones	The DSP multispan NAC has received excessive CRC errors in a one second period and declares state F5. For E1-PRI certification this is less than 931 errors in one second.
	Green	Off	Red	D-Channel down	
	Green	Off	Amber	Look Back in progress	
F1	Green	Off	Off	No Alarm	

Call Fail

Table 95 lists trouble clear call fails on a DSP multispan NAC.

Table 95 Call Fail Diagnostics

Call Fail	Description	Trouble Clearing
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.

Table 95 Call Fail Diagnostics (continued)

Call Fail	Description	Trouble Clearing
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 Time-out	The modems failed to negotiate the V.42 Detection (XID Exchange) phase.	N/A
SABME Time-out (Set Asynchronous Balance Mode Extended)	The modems failed this part of V.42 link negotiation.	Set asynchronous balance mode extended.

Modem Disconnect

Table 96 lists trouble clear modem disconnects.

If a modem makes contact with another modem, but cannot complete protocol and speed negotiations, CommWorks considers this a call fail, not a modem disconnect.

Table 96 Modem Disconnect Trouble Locating and Clearing

Disconnect Reason	Description	Trouble Clearing Notes
Escape code	The operator sent the modem the +++ escape code.	The remote modem user is responsible.
General Switch Telephone Network (GSTN) 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 time-out	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.
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.

Table 96 Modem Disconnect Trouble Locating and Clearing (continued)

Disconnect Reason	Description	Trouble Clearing Notes
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 Time-out	Incompatible processing of a Break signal occurred.	Try connecting again.
Invalid Code word	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, try 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 Step-up	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.
Modem On Hold Cleardown request received	V.92 client initiated a disconnect	Normal disconnect or the client expected more on-hold time negotiated. If necessary, increase the on-hold thresholds in S78.
Modem On Hold Teardown	V.92 client violated MOH handshake	Report client model ans software version to CommWorks Customer Support.
Modem On Hold Timeout	Instance timer threshold or total timer threshold reached	If necessary, increase the on-hold thresholds in S78.

ENFAS Trouble Locating and Clearing

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

- Check the card configuration. 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 ENFAS found in the *Initial Configuration—SS7 Signaling* chapter.
- 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 the "Configuring Primary Rate Interface" section of the *Initial Configuration—T1 Primary Rate Interface* chapter.

- 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 *Initial Configuration—SS7 Signaling* chapter.
- Problems may result from the telephone company side. If your settings are correct, call your telephone company to be sure they have connected your line to the correct switch type. Also, be sure they have given you the correct interface ID.

SS7 and the DSP Multispan

This topic describes how to trouble clear SS7 connections on the DSP multispan card.

1 To verify the connection, type:

`display ss7 slots`

The output of this command looks similar to the following.

```
SS7 SLOT MANAGEMENT

SLOT OWNER TYPE CONNECTION STATUS DOWN REASON

1 NO DYNAMIC DOWN None

2 NO DYNAMIC DOWN None

3 NO DYNAMIC DOWN Manual Disconnect

4 NO DYNAMIC DOWN None

5 NO DYNAMIC DOWN None

6 NO DYNAMIC DOWN None

7 NO DYNAMIC DOWN None

8 NO DYNAMIC DOWN None

9 NO DYNAMIC DOWN None

10 YES DYNAMIC DOWN None

11 NO DYNAMIC DOWN None

12 NO DYNAMIC DOWN None

13 YES DYNAMIC DOWN None

14 NO DYNAMIC DOWN None

15 NO DYNAMIC DOWN None

16 NO DYNAMIC DOWN None
```

2 If a slot is indicated as **DOWN**, verify that an SS7 enabled DSP multispan card is in that slot.

3 If a card is present, verify the owner. If the owner is **NO**, check the type.

4 If the type is set to dynamic, the network management card informs the router card about the presence of the DSP multispan.

5 If set to static, it means that DSP multispan ownership is statically configured. For SS7 to make a connection to the slot the router card has to be the owner.

6 To manually reestablish a connection to a slot, type:

connect ss7 slot <slot_number>

SS7 and the Access Router Card

This section describes how to trouble clear SS7 and contains two sections.

- Verifying the SLAP connection to the SS7 Gateway
- Using the Monitor Protocol

Verifying the SLAP Connection to the SS7 Gateway

The first step in trouble clearing SS7 is to verify the connection to the SS7 gateway.

1 To show the status of the SLAP connection to the SS7 gateway, type:

show ss7 slap status

The entries that are listed are as follows:

- PRIMARY/SECONDARY GATEWAY: This shows the current status of the connection to the gateway. The values are UP, DOWN and Connecting.
- PRIMARY/SECONDARY GW DOWN CAUSE: The reason the SLAP connection to the gateway is down. The values are:
  - None
  - Heartbeat Expired
  - Socket Error (GW closed connection)
  - Physical Link Cut
  - Manual Disconnect

2 If the status for a gateway is listed as **DOWN**, verify that both the Primary IP address and port number are correct. To check this information, type:

show ss7 settings

3 To correct these settings, type:

set ss7 slap_v2

For more information on this command refer to the *Access Router Card Command Line Interface Reference*.

Using the Monitor Protocol

The access router card Protocol Monitor utility can be used to decode the SS7 signals in real time.

1 To start the protocol monitor, type:

monitor protocol

The menu appears.

2 Enter the letter that corresponds to SS7.

B TECHNICAL SPECIFICATIONS

This appendix describes the technical specifications of the hardware for the CommWorks Total Control® 1000 chassis.

This appendix contains the following topics:

- FCC Part 15 Compliance Statement
- Chassis
- Intregrated Fan Tray Environment
- Power Supply Units
- Network Management Card
- Access Router Card
- DSP Multispan Card
- DS-3 Ingress Card
- SDH STM-0 Card

FCC Part 15 Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case users are required to correct the interference at their own expense.

Chassis

The chassis is certified and approved to be fully compliant with the applicable sections as listed in Table 97. It lists the ElectroMagnetic Interference (EMI)/Radio Frequency Interference (RFI), safety and telephone company certifications and regulations.

Table 97 Chassis Certification

Certification	Regulation
EMI/RFI	■ FCC 15A ■ EN55022A
Safety	■ UL 1950 ■ C-UL ■ EN 60950 ■ JATE
Telco	■ FCC 68 ■ IC CS-03

Environment

The chassis must be shipped and stored in the environmental conditions listed in Table 98.

Table 98 Chassis Shipping Environment

Environment	Specification
Temperature	-25 to 75° C, -13 to 167° F
Humidity	0 to 100%, Non-condensing

The chassis must operate in the environmental conditions listed in Table 99.

Table 99 Chassis Operating Environment

Environment	Specification
Temperature	0 to 40° C, 32 to 104° F
Humidity	0 to 95%, Non-condensing

Physical Dimensions

The chassis dimensions are listed in Table 100.

Table 100 Chassis Dimensions

	Length	Width	Height
Inches	18.590	19.000	8.719
Centimeters	47.219	48.260	22.15

Intregrated Fan Tray Environment

The fan tray must be shipped and stored in the environmental conditions listed in Table 101.

Table 101 Fan Tray Shipping Environment

Environment	Specification
Temperature	-25 to 75° C, -13 to 167° F
Humidity	0 to 100%, Non-condensing

The fan tray operates under the environmental conditions listed in Table 102.

Table 102 Fan Tray Operating Environment

Environment	Specification
Temperature	0 to 40° C, 32 to 104° F
Humidity	0 to 95%, Non-condensing

The fan tray dimensions are listed in Table 103.

Table 103 Fan Tray Dimensions

	Length	Width	Height
Inches	18.000	19.000	1.68
Centimeters	45.72	48.26	4.27

Power Supply Units

The following are the technical specifications for the Power Supply Units (PSU).

Environment

The PSU must be shipped and stored in the environmental conditions listed in Table 104.

Table 104 PSU Environment

Environment	Specification
Temperature	-40° C, -13 to 60° C
Relative Humidity	10 to 95%, Non-condensing

The PSU must operate in the environmental conditions listed in Table 105.

Table 105 PSU Operating Environment

Environment	Specification
Temperature	5° C to 40° C
Relative Humidity	20 to 80%, Non-condensing

Physical Dimensions

The PSU dimensions are listed in Table 106.

Table 106 PSU Dimensions

	Inches	Centimeters
Length	18.59	47.219
Width	19.00	48.26
Height	8.72	22.15

Input Power

The voltage for the PSU is listed in Table 107.

Table 107 PSU Voltage Range

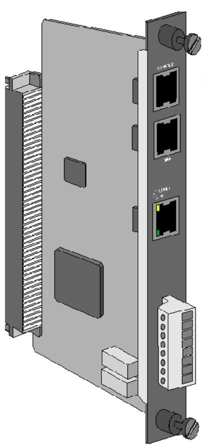
Power Input	Voltage Range
AC	90 VAC to 264 VAC at 47-63 Hz
DC	-40 VDC to -60 VDC

Network Management Card

The network management card manages all the devices on the Media Gateway chassis.

The network management card set includes a front-loaded NAC and an associated rear-loaded NIC.

10/100 Ethernet Aux I/O NIC Specifications



The 10/100 Dual Ethernet Aux I/O card is used as the network management card's network interface card (NIC). It must be installed before the network management NAC and it must be installed in the rear of the chassis in slot 17.

Certification

Certification and regulatory information of the 10/100 Dual Ethernet Aux I/O card is listed in Table 108.

Table 108 10/100 Dual Ethernet Aux I/O Certification

Certification	Regulation
EMI/RFI	■ FCC 15A ■ EN55022A ■ EN 50082-1 ■ VCCI, AUSTEL
Safety	■ UL 1950 ■ C-UL ■ EN 60950

Interface Specifications

There are two types of interfaces on the 10/100 Dual Ethernet Aux I/O card. They are:

- Console and WAN Port
- Ethernet 10Base-T/100Base-Tx Port

Console and WAN Port

The console and WAN port has the specifications listed in Table 109.

Table 109 Console and WAN Port Specifications

Specification	Description
Electrical specification	EIA RS–232–D standard
Connector	RJ–45, 8-position modular jack
Configuration	Data Terminal Equipment (DTE)
Transmission method	Unbalanced RS–232, 1-stop bit, no parity
Transmission rate	57.6 Kbps maximum

Console and WAN cable specifications

The console and WAN cable has the specifications listed in Table 110

Table 110 Console and WAN Cable Specifications

Specification	Description
Wire type	Belden 9538 or equivalent, 8-conductor, shielded
Max cable distance	50 ft. (15 m)
Cabling	8-position modular jack to DB-25 (IBM AT pinout)
Nominal direct current resistance	
Center conductor	24-gage (7 strands, 32-gage) 0.61 mm diameter 23.7 ohms/1000 ft. (77.8 ohms/km)
Shield	15.5 ohms/1000 ft. (50.9 ohms/km)
Outside diameter	0.265 in (6.73 mm)
Capacitance between conductors	30 picofarads/ft. (98 picofarads/m)

Ethernet 10 Base-T/100Base-Tx Port

The Ethernet 10Base-T/100Base-Tx port has the specifications listed in Table 111.

Table 111 Ethernet 10Base-T/100Base-Tx Port Specifications

Specification	Description
Data transfer rate	10/100 Mbps (auto-negotiated)
Connector	8-position modular jack (Stewart 88-360808 or equivalent)
Accessing scheme	CSMA/CD (Carrier Sense Multiple Access with Collision Detection)
Topology	Star-wired hub (using multiport repeater)
Maximum nodes	Limited only by repeater used
Transmission medium	Unshielded twisted pair (UTP) **10Base-T:** Type CAT3 or CAT5 (CAT5 recommended) **100Base-Tx:** Cable type CAT5 only
Network lobe distance	100 m (328 ft.) suggested maximum. Longer cabling can be used at the expense of reduced receiver squelch levels.

Ethernet 10 Base-T/100 Base-Tx Cable Specifications

The Ethernet 10Base-T/100Base-Tx cable has the specifications listed in Table 112.

Table 112 The Ethernet 10Base-T/100Base-Tx Cable Specifications

Specification	Description
Wire type	0.5 mm or 24 AWG twisted pairs
Max cable distance	100 m (328 ft.) with standard receiver squelch levels
Cable loss	67 dB/1000 ft@100 MHz
Characteristic impedance	85-115 ohms
Propagation delay	± 5.7 nanosecond/m
Cabling	RJ-45 plug to RJ-45 plug straight through for multiport repeater applications.

Environment

The 10/100 Dual Ethernet Aux I/O card must be shipped and stored in the environmental conditions listed in Table 113.

Table 113 10/100 Dual Ethernet Aux I/O Card Shipping and Storage Environment

Environment	Specification
Temperature	-25 to 75° C, -13 to 167° F
Relative Humidity	0 to 100%, Non-condensing

The 10/100 Dual Ethernet Aux I/O card must operate in the environmental conditions listed in Table 114.

Table 114 10/100 Dual Ethernet Aux I/O Card Operating Environment

Environment	Specification
Temperature	0 to 40° C, 32 to 104° F
Relative Humidity	0 to 95%, Non-condensing

Physical Dimensions

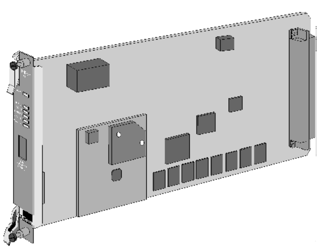
The 10/100 Dual Ethernet Aux I/O card dimensions are listed in Table 115.

Table 115 10/100 Dual Ethernet Aux I/O Card Dimensions

	Inches	Centimeters
Length	5.30	13.46
Width	0.79	2.00
Height	6.90	17.53

CAUTION: *Never install a network management card in a chassis without a fan tray! Heat damage to the network management card's components could result.*

Network Management Card NAC Specifications



The network management card contains a mobile Pentium III processor running at 333 MHz. The processor module incorporates a Dynamic Random Access Memory (DRAM) socket to allow you to easily upgrade your card's memory when necessary.

Also, the processor module contains an Intel 440BX system controller, clock generator, and voltage generator for both the Pentium III processor and the DRAM socket.

Environment

The network management card NAC must be shipped and stored in the environment conditions listed in Table 116.

Table 116 Network Management Card Shipping and Storage Environment

Environment	Specification
Temperature	-25 to 75° C, -13 to 167° F
Humidity	0 to 100%, Non-condensing

The network management card must operate in the environment conditions listed in Table 117.

Table 117 Network Management Card Operating Environment

Environment	Specification
Temperature	0 to 40° C, 32 to 104° F
Humidity	0 to 95%, Non-condensing

Physical Dimensions

The network management card NAC dimensions are listed in Table 118.

Table 118 Network Management Card NAC Dimensions

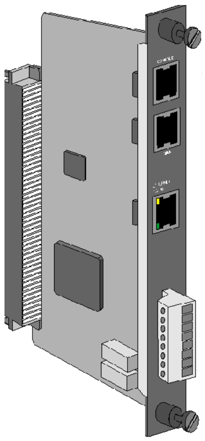
	Inches	Centimeters
Length	12.95	32.89
Width	0.79	2.01
Height	6.90	17.53

Access Router Card

The access router card is a multi-protocol, dial-up router and terminal server commonly described as a remote access server. It is a software-based router for incoming call traffic terminated on Digital Signal Processor (DSP) multispan Network Application Cards (NACs). access router cards receive incoming traffic from DSP multispan cards, encrypt the information and forward this traffic on to various egress ports.

The access router card set includes a front-loaded NAC and an associated rear-loaded NIC.

PCI Dual 10/100 Base-T Ethernet Network Interface Card Specifications



The PCI Dual 10/100 Base-T Ethernet Network Interface Card (NIC) provides an Ethernet interface between a Network Application Card (NAC) in the CommWorks Total Control chassis and your network.

Certification

The details of the certification information is listed in Table 119.

Table 119 PCI Dual 10/100 Base-T Ethernet Network Interface Card Certification

Certification	Regulation
EMC	■ CISPR 22, Class B, radiated and line conducted ■ FCC Part 15, Class A, radiated and line conducted ■ VDE 0878 ■ EN 55022, EMI ■ EN 55022, Electrostatic Discharge ■ EN 55022, Immunity (Susceptibility), radiated and line conducted
Safety	■ UL 1950, as applicable in this case ■ CSA approved C22.2 No. 0.7; C22.2 No. 225-M 1986; CSA 950 ■ IEC 950, IEC 380 ■ EN 41003, EN 60950

Interface Specifications

RS-232 Port

Table 120 contains the RS-232 port interface specifications.

Table 120 RS-232 Port Interface Specifications

Specification	Description
Electrical specification	RS-232-C (EIA/TIA-232-E standard)
Connector	RJ-45, 8 position modular jack
Configuration	Data Terminal Equipment (DTE)
Transmission method	Unbalanced RS-232
Transmission rate	115,200 bps maximum

Ethernet 10Base-T/100 Base-TX Ports

Table 121 contains the ethernet 10Base-T/100 base-TX port interface specifications.

Table 121 Ethernet 10Base-T/100 Base-TX Port Interface Specifications

Specification	Description
Data Transfer Rate	10/100 Mbps Auto-negotiated
Connector	8-position modular jack, Stewart 88-360808 or equivalent
Accessing Scheme	CSMA/CD (Carrier Sense Multiple Access with Collision Detection)
Topology	Star Wired Hub (using multiport repeater)
Maximum Nodes	Limited only by repeater used
Transmission medium	Unshielded Twisted Pair (UTP) cable type CAT3 or CAT5 (CAT5 recommended) for 10Base-T applications, CAT5 for 100Base-TX
Network Lobe Distance	100 meters (328 ft.) suggested maximum (Longer cabling can be used at the expense of reduced receiver squelch levels)

Environment

The PCI Dual 10/100 Base-T Ethernet Network Interface Card must be shipped and stored in the environmental conditions listed in Table 122.

Table 122 PCI Dual 10/100 Base-T Ethernet Network Interface Card Shipping and Storage Environment

Environment	Specifications
Temperature	-25° to 75° C, -13° to 167° F
Relative Humidity	0 – 100%, non-condensing

The PCI Dual 10/100 Base-T Ethernet Network Interface Card must operate in the environmental conditions listed in Table 123.

Table 123 PCI Dual 10/100 Base-T Ethernet Network Interface Card Operating Environment

Environment	Specifications
Temperature	0° to 50° C, 32° to 122° F
Relative Humidity	0 – 95%, non-condensing

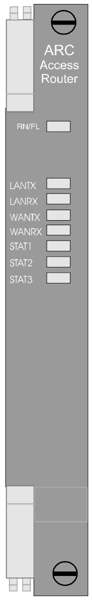
Physical Dimensions

The PCI Dual 10/100 Base-T Ethernet Network Interface Card dimensions are listed in Table 124.

Table 124 PCI Dual 10/100 Base-T Ethernet Network Interface Card Dimensions

	Inches	Centimeters
Length	4.40	11.18
Width	.79	2.01
Height	6.40	16.26

Network Application Card Specifications



The access router card provides terminal server, remote access and LAN-to-LAN routing services through analog and digital connections in a multi-protocol LAN/WAN networking environment.

Certification

The details of the certification and regulatory information is listed in Table 125.

Table 125 Access Router Card Certification and Regulation

Certification	Regulation
EMI/RFI	■ FCC 15A ■ EN55022A
Safety	■ UL 1950 ■ C-UL ■ EN 60950 ■ JATE
Telco	■ FCC 68 ■ IC CS-03

Processor

The access router card architecture uses the PowerPC 750 as its main engine and a chipset that supports SDRAM for memory/PCI local bus interface. The chipset provides 64-bit CPU access to the system memory. The access router card's CPU core contains the following elements:

- PowerPC 750 CPU
- SDRAM
- SDRAM controller/PCI bridge
- Clock generation/distribution
- Encryption hardware support
- CPU supervisory circuit (Watchdog timer, reset)
- Voltage regulators
- Backside L2 cache subsystem (1MB)
- CPU performance monitoring port
- PCI-to-PCI Bridge

Hardware Specifications

Table 126 describes basic hardware specifications.

Table 126 Hardware Specifications

Description	Specification
Certification	Complies with FCC Part 15, UL-listed, CSA-approved
Processor	PowerPC 750, 375 MHz

Table 126 Hardware Specifications (continued)

Description	Specification
Synchronous Dynamic Random Access Memory (SDRAM)	256 MB on board
CompactFlash	32 MB
Flash BIOS	128 KB x 8
L2 Cache	1 MB
Compatibility	access router card, DSP multispan, network management card,
Physical Dimensions	12.95 x 0.79 x 6.90 inches 32.89 x 2.01 x 17.53 centimeters

Software Specifications

The following section lists software standards supported by the access router card.

Routing Support

- Transparent on-demand, manual, timed, continuous and bandwidth on-demand routing
- IP protocol routing
- IPX protocol routing
- Inverse multiplexing with programmable load balancing
- Host, subnet, and network routes supported
- Selective default routing
- Continuous connection (automatically retries after connection loss)

Administration

- Local FLASH ROM for booting & configuration storage
- Support for Domain Name Service (DNS)
- Call activity logging
- SNMP management - MIB II and additional proprietary MIBs
- High Performance Access Router Manager GUI
- Telnet command line interface
- Tracing to console or SYSLOG host
- Ping & traceroute utilities
- Network and port monitoring
- Dial-in management access
- Password security for management access - optional
- RADIUS and TACACS+ accounting and authentication

Filtering and Security

- IP, IPX, IPX RIP, IPX SAP, IP RIP, and source/destination filtering
- Set inbound and outbound Packet Filtering independently
- Compatible with RADIUS authentication servers
- IP address pools
- IP address assignment per router or port

PPP Specific Features

- Address and control field compression
- STAC data compression for PPP payload
- Protocol field compression
- PAP and CHAP authentication protocols
- Magic number loopback detection
- Maximum receive unit negotiation
- Async control character map negotiation
- IP Address negotiation and assignment
- IPX Address negotiation and assignment
- RFC 1877 DNS NETBios server configuration
- Van Jacobson (symmetric) compression TCP/IP headers
- IPCP
- Multilink (MLPPP)
- RFC 1331, 1332, 1334 for PPP

Industry Standards Support

- TCP (Transmission Control Protocol)
- IP (Internet Protocol)
- IPX (Internet Packet eXchange)
- RIP (Routing Information Protocol) V1 and V2 with optional authentication
- OSPF (Open Shortest Path First) protocol support
- CIDR (Classless Interdomain Routing)
- SLIP (Serial Line Internet Protocol)
- CSLIP (Compressed SLIP)
- CCP (Compression Control Protocol) with support for STAC algorithms
- ICMP (Internet Control Message Protocol)
- UDP (User Datagram Protocol)
- ARP (Address Resolution Protocol)

- Telnet, Rlogin, ClearTCP
- PPP (Point to Point Protocol)
- RFC 2138, 2030, 1858, 1850, 1742, 1717, 1695, 1659, 1650, 1612, 1611, 1577, 1573, 1483, 1448, 1407, 1406, 1334, 1305, 1220, 1213, 1212, 1058, 1035, 1034, and backward compatible w/ RFC 1171, 1172 and others

Client Dial-up Support

- SLIP, CSLIP, and PPP with automatic PPP detection
- Telnet and Rlogin
- Dynamic address assignment per call
- x2 support

Other Features

- Per-user packet firewall
- Dial-out for ISDN/analog with DSP multispan and Quad Modem cards

SLIP and PPP Client Software Support

We support clients which adhere to PPP, SLIP and IPCP. SLIP dial-out is not supported at this time.

Environmental Considerations

Table 127 specifies shipping and storage specifications.

Table 127 Hardware Shipping and Storage Environment

Environment	Specifications
Temperature	-25 to 75° C, -13 to 167° F
Humidity	0 to 100%, Non-condensing

Table 128 specifies operating specifications

Table 128 Hardware Operating Environment

Environment	Specifications
Temperature	0 to 40° C, 32 to 104° F
Humidity	0 to 95%, Non-condensing

Backplane Pinouts

The following table lists backplane pinouts and signals. These are used for Network Application Support (NAS).

Pin Status Legend

Use the following legend to reference the backplane pinouts found in the Table 129 below:

- P–Power pins
- E–Extended signal ground pins
- R–Ring bus
- F–Front to back pins
- D–Dedicated network management card slot to pins
- B–Bussed pins (all slots)
- A–Hard address lines

Items in parentheses are original definitions which are not in the shipping product.

Table 129 Backplane Pinouts and Signals

	Row A	S	Row B	S	Row C	S	Row D	S
1	NC*(PB_CLK33)	B	GND	P	NAC_DCLK	B	GND	E
2	GND	P	TDM_BITCLK	B	PB_ID0	A	PCI_CLK	F
3	NC*(PB_CLK20)	B	GND	P	NAC_FCSTB	B	NAC_PCI_IO Voltage	F
4	GND	P	TDM_TSCLK	B	PB_ID1	A	NIC_RESET#	F
5	PB_CLK10	B	GND	P	NC*(NIC_DD)	B	User Port RXD*(TBD)	F
6	GND	P	TDM_FS	B	NC*(NIC_UD0-15)	D	User Port DCD*(TBD)	F
7	PB_AD0	B	GND	P	NIC_FC0-15	D	User Port TXD*(TBD)	F
8	PB_AD1	B	TDM_HW1A	B	NAC_UD0-15	D	User Port DSR*(TBD)	F
9	PB_AD2	B	TDM_HW1B	B	NAC_DD0-15	D	User Port RTS*(TBD)	F
10	PB_AD3	B	GND	P	PB_ID2	A	User Port CTS*(TBD)	F
11	GND	P	TDM_HW5A* (GPR0)	R	TDM_HW6A* (GPR2)	R	User Port DTR*(TBD)	F
12	PB_AD4	B	TDM_HW5B* (GPR1)	R	TDM_HW6B* (GPR3)	R	NAC_PRESENT#	F
13	PB_AD5	B	GND	P	PB_ID3	A	INTB#	F
14	PB_AD6	B	TDM_HW2A	B	NIC_ID	F	GNTB#	F
15	PB_AD7	B	TDM_HW2B	B	NIC_IDCLK	F	REQB#	F
16	GND	P	GND	P	INTA#	F	-5v	P
17	PB_AD8	B	TDM_HW3A	B	GNTA#	F	REQA#	F
18	PB_AD9	B	TDM_HW3B	B	AD31	F	AD30	F
19	PB_AD10	B	GND	P	AD29	F	AD28	F
20	PB_AD11	B	TDM_HW4A	B	AD27	F	AD26	F
21	GND	P	TDM_HW4B	B	AD25	F	AD24	F
22	PB_AD12	B	GND	P	C_BE3	F	AD23	F
23	PB_AD13	B	NC*(GPB4)	B	AD22	F	AD21	F
24	PB_AD14	B	NC*(GPB5)	B	AD20	F	+5V	P
25	PB_AD15	B	NC*(GPB6)	B	AD19	F	+5V	P

Table 129 Backplane Pinouts and Signals (continued)

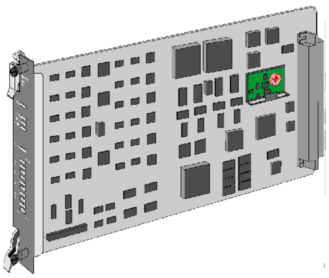
	Row A	S	Row B	S	Row C	S	Row D	S
26	GND	P	NC*(GPB7)	B	AD18	F	+5V	P
27	PB_AD16	B	TDM_HW7A* (GPB8)	B	AD17	F	+5V	P
28	PB_AD17	B	TDM_HW7B* (GPB9)	B	AD16	F	C_BE2	F
29	PB_AD18	B	TDM_SFSN* (GPB10)	B	FRAME#	F	IRDY#	F
30	PB_AD19	B	GND	P	TRDY#	F	DEVSEL#	F
31	GND	P	PB_START	B	STOP#	F	PERR#	F
32	PB_AD20	B	PB_ACK	B	SERR#	F	PAR	F
33	PB_AD21	B	TDM_HW8A* (PB_20ID)	B	C_BE1	F	AD15	F
34	PB_AD22	B	TDM_HW8B* (PB_33ID)	B	AD14	F	+12V	P
35	PB_AD23	B	PB_TM0	B	AD13	F	AD12	F
36	GND	P	PB_TM1	B	AD11	F	AD10	F
37	PB_AD24	B	GND	P	AD9	F	AD8	F
38	PB_AD25	B	NC*(PB_TM2)	B	C_BE0	F	AD7	F
39	PB_AD26	B	PB_PAR* (PB_TM3)	B	AD6	F	-12V	P
40	PB_AD27	B	PB_ARB0	B	AD5	F	NC*(GPB0)	B
41	GND	P	PB_ARB1	B	AD4	F	NC*(GPB1)	B
42	PB_AD28	B	PB_ARB2	B	AD3	F	Chassis GND	P
43	PB_AD29	B	PB_ARB3	B	AD2	F	NC*(GPB2)	B
44	PB_AD30	B	NC*(PB_NMRQ)	B	AD1	F	NC*(GPB3)	B
45	PB_AD31		PB_RQST	B	AD0	F	GND	E

DSP Multispan Card

The DSP multispan modem card set includes a front-loaded NAC and an associated rear-loaded NIC. Depending on your application needs, the DSP multispan NAC/NIC card set provides Wide Area Network (WAN) ingress access through four T1 spans located on a DSP multispan T1 NIC or three E1 spans located on a DSP multispan E1 NIC.

The DSP multispan card set includes a front-loaded NAC and an associated rear-loaded NIC.

Network Interface Card Specifications



The DSP multispan T1/E1 Network Interface card (NIC) provides the physical interface to terminate a single T1 or E1 span for the DSP multispan network management card.

Certification

The DSP multispan NIC is certified and approved to be fully compliant with the applicable sections as listed in Table 130. It lists the ElectroMagnetic Interference (EMI)/Radio Frequency Interference (RFI), safety and telephone company certifications and regulations.

Table 130 DSP Multispan T1/E1 NIC Certification and Regulation

Certification	Regulation
EMI/RFI	■ FCC 15, Class A ■ EN 55022 ■ Korean and Taiwan EMI Requirements ■ Bellcore GR-1089-CORE ■ Austel AS-3281 ■ VCCI, Class A
Safety	■ UL 1950 ■ IEC 950 ■ Austel TS-001 ■ NOM-019-SCFI-1993 ■ EN 60950
Telco	■ FCC 68 ■ IC CS-03

Interface Specifications

This section describes the technical specifications for the serial port and span port interfaces located on the DSP multispan T1/E1 NIC.

Serial Ports

The serial ports have the specifications listed in Table 131.

Table 131 Serial Port Specifications

Specification	Description
Electrical Specification	RS-232-C (EIA/TIA-232-E standard)
Connector	RJ-45, 8 position modular jack
Configuration	Data Terminal Equipment (DTE)
Transmission Method	Unbalanced RS-232
Transmission Rate	Console port: 9600 bps maximum Auxiliary port: 115,200 bps maximum

Span Ports

The span ports have the specifications listed in Table 132.

Table 132 Serial Port Specifications

Specification	Description	Specification
Connector	RJ-48C, 8 position modular jack	
Specifications	■ ANSI T1.408 ■ ITU G.736 ■ ITU G.823 ■ ETSI 300-233 ■ I.431/ ETSI ETS 300 011	■ ANSI T1.403 ■ ITU G.703 ■ ITU G.775 ■ ETSI 300-166 ■ TBR-12
Framing	**T1 (CH T1 and T1/PRI Application** ■ Super Frame (SF) or D4 ■ Extended Super Frame (ESF) **E1/PRI Application** ■ CEPT CCS without CRC-4 (Used with VN-4 and some NET5 countries) ■ CEPT CCS with CRC-4 (Used with NET5 countries)	
Line Coding	**CH T1** ■ Binary Eight Zero Code Suppression (B8ZS) ■ Alternate Mark Inversion (AMI) ■ Zero Code Suppression **T1/PRI** ■ Binary Eight Zero Code Suppression **E1/PRI** ■ High Density Bipolar 3 Zeros (HDB3)	
Interfaces	**CH T1** ■ DS1 (Long Haul Applications. Connecting CPE equipment to the Telco's T1 or Smart Jack up to 6000 feet away). ■ DSX-1 (Short Haul Application. Connecting CPE equipment to the Telco's T1 or Smart Jack up to 600 feet away).	

Environment

This section describes the proper shipping, storage, and operating conditions for the DSP multispan T1/E1 NIC.

The DSP multispan T1/E1 NIC must be shipped and stored in the environmental circumstances listed in Table 133.

Table 133 DSP Multispan T1/E1 NIC Shipping and Storage Environment

Environment	Specifications
Temperature	-25 to 75° C, -13 to 167° F
Relative Humidity	0 to 100%, Non-condensing

The DSP multispan T1/E1 NIC operates under the environmental circumstances listed in Table 134.

Table 134 DSP Multispan T1/E1 NIC Operating Environment

Environment	Specifications
Temperature	5 to 40° C, 37 to 104° F
Relative Humidity	0 to 95%, Non-condensing

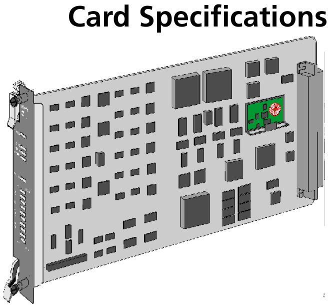
Physical Dimensions

Table 135 lists the physical dimensions of the DSP multispan T1/E1 NIC.

Table 135 DSP Multispan T1/E1 NIC Dimensions

	Inches	Centimeters
Length	5.30	13.46
Width	.79	2.00
Height	6.90	17.53

Network Application Card Specifications



The DSP multispan NAC provides WAN ingress access through T1/E1, Primary Rate Interface (PRI).

Incoming calls terminate on highly integrated modems found within the DSP multispan NAC. Users receive WAN access either through Pulse Code Modulated (PCM) encoded analog calls that have been converted to baseband or through ISDN digital data calls.

Once modems process analog and digital calls, the DSP multispan NAC passes the data across the Packet Bus to the access router card. The access router card performs encryption and standard routing functions.

Certification

The DSP multispan NAC is certified and approved to be fully compliant with the applicable sections as listed in Table 136. It lists the ElectroMagnetic Interference (EMI)/Radio Frequency Interference (RFI), safety and telephone company certifications and regulations.

Table 136 DSP Multispan NAC Certification and Regulation

Certification	Regulation
EMI/RFI	■ FCC 15, Class A ■ EN 55022 ■ Korean and Taiwan EMI Requirements ■ Bellcore GR-1089-CORE ■ Austel AS-3281 ■ VCCI, Class A
Safety	■ UL 1950 ■ IEC 950 ■ Austel TS-001 ■ NOM-019-SCFI-1993 ■ EN 60950
Telco	■ FCC 68 ■ IC CS-03

Processor

The DSP multispan NAC contains two types of processor systems. Table 137 describes these two processor systems.

Table 137 DSP Processor Systems

Processor System	Processor Type
Board Manager System	PowerPC RISC CPU
Modem Module Co-Processors	Dual PowerPC RISC CPUs

The DSP multispan NAC contains a deeply embedded IBM Prowler 405 RISC Processor. This processor contains the following components:

- PCI Controller
- 16550 UART
- IIC Controller
- SDRAM Controller
- External Bus Controller

Environment

This section describes the proper shipping, storage, and operating conditions for the DSP multispan.

The DSP multispan must be shipped and stored in the environmental conditions listed in Table 138.

Table 138 Shipping and Storage Environment

Environment	Specifications
Temperature	-25 to 75° C, -13 to 167° F
Humidity	0 to 100%, Non-condensing

The DSP multispan operates under the environmental conditions listed in Table 139.

Table 139 Operating Environment

Environment	Specifications
Temperature	0 to 40° C, 32 to 104° F
Humidity	0 to 95%, Non-condensing

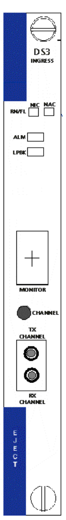
Physical Dimensions

Table 140 lists the physical dimensions of the DSP multispan.

Table 140 Network Application Card Physical Dimensions

	Inches	Centimeters
Length	12.95	32.89
Width	0.79	2.01
Height	6.90	17.53

DS-3 Ingress Card



The DS-3 ingress card set is part of the Total Control 1000 enhanced data system. The DS-3 card set provides Wide Area Network (WAN) ingress options for the DSP multispan modem system. The card set contains a Network Interface Card (NIC) and a Network Application Card (NAC).

The DSP multispan NAC possesses a four span modem architecture containing 96 port options for T1 applications and a three span modem architecture containing 90 port options for E1 applications. You have the choice of providing WAN ingress access through four T1 spans on a DSP multispan T1 NIC, or three E1 spans on a DSP multispan E1 NIC, or one T3 span on the DS-3 ingress card set. This allows you to configure and manage your Total Control 1000 hub according to your customized needs.

The specifications for the DS-3 card set is the same for the NIC and the NAC unless otherwise noted.

Certification

The DS-3 ingress card set is certified and approved to be fully compliant with the applicable sections as listed in Table 141. It lists the ElectroMagnetic Interference (EMI)/Radio Frequency Interference (RFI), safety and telephone company certifications and regulations.

Table 141 Certification Information

Certification	Regulation
EMI/RFI	■ FCC Part 15, Class A ■ EN 55022
Safety	■ UL 1950 (3rd Edition - C/UL) ■ IEC 950 ■ EN 60950 (3rd Edition CB Report) ■ Austel TS-001 (i.e., AS 3260) ■ Bellcore TR-NWT-001089 ■ GR-1089-CORE ■ NOM-019-SCFI-1993 (Mexico)
EMC	■ EN 50082 ■ IEC 1000-3-2 Harmonic Current Emissions ■ IEC 1000-4-2 ESD ■ IEC 1000-4-3 RF Immunity ■ IEC 1000-4-4 Fast Transient/Burst ■ IEC 1000-4-5 Surge
Telco	■ FCC CFR 47, part 68 ■ IC CS-03 (Canada)

Operational Memory

The DS-3 ingress NAC requires the memory listed in Table 142.

Table 142 Operational Memory

Memory	Requirements
Synchronized Dynamic Random Access Memory (SDRAM)	32Mb
Flash Read-Only Memory (Flash ROM)	16Mb

Data Retention Method

The DS-3 ingress NAC supports one single Synchronized Dynamic Random Access Memory (SDRAM) memory module.

Current Draw

The current draw for the DS-3 ingress NAC is 5.13A (of + 5V) typical maximum.

The current draw for the DS-3 ingress NIC is +5 VDC @ 1500m typical maximum.

Typical maximum refers to the maximum current draw under most typical configurations.

Environment

This section describes the proper shipping, storage, and operating conditions for the DS-3 ingress card set.

Shipping and Storage

The DS-3 ingress card set must be shipped and stored in the environmental conditions listed in Table 143.

Table 143 Shipping and Storage Environment

Environment	Specifications
Temperature	-25 to 75° C, -13 to 167° F
Humidity	0 to 100%, Non-condensing

Operating

The DS-3 ingress card set operates under the environmental conditions listed in Table 144.

Table 144 Operating Environment

Environment	Specifications
Temperature	5 to 40° C, 37 to 104° F
Humidity	0 to 95%, Non-condensing

Physical Dimensions

Table 145 lists the physical dimensions of the DS-3 ingress card set.

The dimensions for the DS-3 ingress NAC are described in Table 145.

Table 145 DS-3 Ingress NAC Physical Dimensions

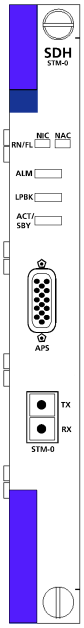
	Inches	Centimeters
Length	12.95	32.89
Width	0.79	2.01
Height	6.90	17.53

The dimensions for the DS-3 ingress NIC are described in Table 146

Table 146 DS-3 Ingress NIC Dimensions

	Inches	Centimeters
Length	5.30	13.46
Width	.79	2.00
Height	6.90	17.53

SDH STM-0 Card



The SDH (Synchronous Digital Hierarchy) STM-0 module contains a front-loaded SDH STM-0 NAC and a rear-loaded SDH STM-0 NIC. The SDH STM-0 module provides an optical WAN ingress option for the DSP multispan modem system.

The SDH STM-0 NAC terminates a Sychronous Transport Module (STM-0) over an OC-1 optical fiber interface, de-maps 28 VC-11 mapped DS-1 signals, and multiplexes the 28 DS-1 signals into one DS-3 stream. The data then travels out through an external DS-3 cable from the SDH STM-0 NIC to the DS-3 NIC.

The SDH STM-0 module works with one DS-3 ingress module (NAC and NIC) and seven DSP multispan NACs.

Certification

Table 147 lists certification and regulatory information.

Table 147 SDH STM-0 Certification

Certification	**Regulation**
EMI/RFI	■ VCCI A
Safety	■ JATE ■ IEC 950
SDH Interface	■ TR550065 (NTT)

Processor

The SDH STM-0 NAC contains an IBM 405GP processor operating at 200MHz.

Operational Memory

Table 148 lists operational memory information.

Table 148 SDH STM-0 Operational Memory

Memory	**Requirements**
Cache	16K instruction cache, 8K data cache
Dynamic Random Access Memory (DRAM)	32M
Flash Read-Only Memory (Flash ROM)	16M
NV RAM	1Kb for manufacturing data, 32Kb for core dump data

Current Draw

The current draw for the SDH STM-0 card set is +5.2 vDC @ 3.0A typical maximum.

Typical maximum refers to the maximum current draw under most typical configurations.

Environment

This section details temperature and humidity environment information.

The SDH STM-0 card set must be shipped and stored in the environmental conditions listed in Table 149.

Table 149 SDH STM-0 Shipping and Storage

Temperature	Humidity
-25 to 75° C, -13 to 167° F	0 to 100%, Non-condensing

The SDH STM-0 card set operates under the environmental conditions listed in Table 150.

Table 150 SDH STM-0 Operating

Temperature	Humidity
0 to 40° C, 32 to 104° F	0 to 95%, Non-condensing

Physical Dimensions

The SDH STM-0 NAC physical dimension's are listed in Table 151.

Table 151 SDH STM-0 Network Application Card Physical Dimensions

	Inches	Centimeters
Length	12.95	32.89
Width	0.79	2.01
Height	6.90	17.53

C CONFIGURATION TABLES

Regardless of the management interface you use, the parameters that you configure are stored in a number of tables that reside in the access router card's FLASH memory.

This appendix describes some important internal databases, or tables that contain configuration information accessed by **list** <keyword> commands. Not all access router card tables are detailed.

This appendix contains the following topics:

- Interface Tables
- User Table
- Local and Login Hosts Tables
- Initialization Script and Global Host Tables
- Facility Level Table
- Module Table
- IP Network Table
- IP Address Pool Table
- IP Interface Block Table
- Forwarding and IP Routing Tables
- SNMP Configuration Tables
- SYSLOG Table
- Event Critical Messages Table
- Filter and Associated Tables
- File Table
- Network Services and Available Servers Tables
- Dial-Out Port Table
- UDP Listeners Table
- TCP Connections Table
- DNS and Associated Tables
- TFTP Access Table
- Traceroute and Traceroute Hop Tables

- Remote Ping and Ping Busy Out Tables
- Address Translation Table
- Chassis and Packet Bus Tables
- CIP Port Parameter Table
- User Manager Active Sessions Table
- Configuration Command Overview

Interface Tables

These tables contain Call Information Process (CIP) and LAN information about all interfaces, including modem ports and ethernet interfaces. They include the: *CIP Port Parameters Table, Modem Port Parameter Table,* and *Modem Group Table.*

User Table

Table 152 contains authentication and configuration information for five types of users: Login, Network, Callback, Dial-out, and Manage users.

Table 152 User Table

User Type	Description
Login	Login users are remote users dialing in to request terminal service from an IP host. Once such a user is authenticated, he or she is connected to a host with a login service such as telnet or Rlogin.
Network	Network users are remote users dialing in to become a virtual node of the local network. Such a user may be an individual attaching to the network or an entire LAN dialing in to route packets onto the local network.
Callback	Callback users are remote users who dial into the device. Once the user is authenticated, the Media Gateway disconnects and dials the user back, using a pre-defined telephone number.
Dial-out	Dial out users are local or remote users who login then connect to a remote host.
Manage	Manage users have administrator-level privileges on the Console or a dialup session.

User table entries override settings for the interface the user is connected.

Local and Login Hosts Tables

The local hosts table contains a list of local hosts and associated IP addresses. It is used to translate names to IP addresses and vice versa. This allows users and administrators to type host names rather than addresses.

The hosts table is especially useful if your network does not have a name service such as DNS. If your network *does* have a name server, the server first tries to match the host name with an IP address using the Hosts Table before using the name server.

The login host table contains hosts you configured using the **add login_host** command.

Initialization Script and Global Host Tables

These tables contain generic modem initialization setup scripts that can be sent to a modem each time the port is reset (a modem resets itself every time it disconnects).

Initialization scripts for modems probably contains the AT commands needed to configure them for use on your network. This table contains information accessed by the **list init_scripts** command.

Facility Level Table

This table is used to configure the log level of all *facilities* (software systems) on the access router card. It contains each event facility and its associated log level. Each facility generates unique event messages during processing which can be sent to a SYSLOG server you define as a means of judging system performance.

Facilities are configurable in that you can change log levels from the defaults shown below. Available log levels are: *verbose, common, unusual* and *critical*, with critical being the most severe event. This table contains information accessed by the **list facilities** command.

Module Table

This table contains information used by *processes* or management features that run in the background. Display a list of these items using the **list processes** command.

IP Network Table

The IP network table contains all generic protocol information about IP networks entered with the **add ip network** command.

IP Address Pool Table

This table holds information on user-configured IP addresses entered with the **add ip pool** command.

IP Interface Block Table

This table contains IP addresses associated with each system interface. Interfaces with point-to-point connections show the neighbor field with the address of the remote system. This table contains information accessed by the **list ip interface_block** command.

Forwarding and IP Routing Tables

These tables contain static and dynamic routing information. Dynamic routes are updated by broadcasts received from other routing devices on the network using the RIP or OSPF routing protocols. Static routes are added to the table manually. A static route to a given site overrides a dynamic route.

Static routes to a given site are required when the site is not running dynamic routing. Without dynamic routing protocol messaging, the access router card cannot gather information on the location of other routers, gateways, and remote hosts and must know exactly where to send a packet.

SNMP Configuration Tables

The access router card provides support for SNMP version 1 and industry standard MIB-II variables. These variables are fully described in your MIB-II documentation.

The SNMP community table stores information about which SNMP servers (if any) are permitted to make SET and GET requests, as well as Read and Write Communities.

The SNMP trap community table saves names and addresses of trap communities.

The SNMP community and trap community pool tables save names and addresses of communities as associated pools.

SYSLOG Table

This table contains IP addresses of SYSLOG hosts to which event messages are sent. You can define multiple SYSLOG hosts that record event messages by the message’s log level.

Event Critical Messages Table

This table contains event messages logged *critical*. Using the **list critical events** command displays these messages to telnet and dial-in sessions as well as the default Console session.

Filter and Associated Tables

File names of filters you create are stored in the filter table but the filters themselves are stored as ASCII text in FLASH memory. The filter_access flag on the interface determines whether user filters take precedence over interface filters.

File Table

This table contains system files and other files you may have loaded in the access router card, including filter files.

Network Services and Available Servers Tables

The network services and available servers tables hold information related to access router card-supported network services such as telnet, SNMP, ClearTCP, DialOut and TFTP. These default services can be edited or new services created with the **add** and **set network services** commands.

Dial-Out Port Table

This table lists virtual ports available for dial-out services.

UDP Listeners Table

This table details User Datagram Protocol (UDP) ports being used by the access router card. These ports correspond to processes which are receiving UDP data (for example SNMP, User Management, TFTP service).

TCP Connections Table

The TCP connections table contains information regarding all system and user-created TCP links.

DNS and Associated Tables

The domain name system tables in the access router card contain resource records about address resolution. The tables include the: DNS host table, DNS server table, DNS cache and negative cache tables, and resolve cache and negative cache tables.

TFTP Access Table

The TFTP access table contains information about available clients for TFTP service. Use the **add tftp client** command to add entries to this table.

Traceroute and Traceroute Hop Tables

The traceroute and traceroute hop tables contain routes that data packets take from their source to a specified destination on the network and the interval to reach each hop and return. Traceroute utilizes the ICMP protocol to monitor network messages and the UDP protocol to transmit packets.

Remote Ping and Ping Busy Out Tables

The remote ping table keeps information on currently active ping requests issued by the **ping** command. The **list ping systems** command displays the information in the table. The ping busy out table keeps entries added for the ping service loss busy-out feature. The **list ping service_loss_systems** command displays them.

Address Translation Table

This table contains the network address to physical address equivalences resolved by ARP.

Chassis and Packet Bus Tables

These tables contain hardware and software information about NIC and NAC cards stored in media gateway slots.

CIP Port Parameter Table

This Call Information Process (CIP) Table contains information regarding current modem connections on the access router card.

User Manager Active Sessions Table

This table contains protocol and other information regarding current network or login user sessions.

Configuration Command Overview

Configuration data is stored in several tables (for example, user and interface tables). You can change most parameters in these tables using the generic **set** command:

```
set [user or interface or system] <parameter name>
<value>
```

For example:

```
set user john message "Configuration Setup"
```

Many objects, such as users, must be created before they can be configured. Use the generic **add** command:

```
add [user or network] <name>
```

You can also complete CLI configuration by using a dial-in modem connection to the access router card.

Anything that you can add can also be deleted, disabled or enabled. You may need to disable objects before deleting them. Use these generic commands:

```
delete [user or network] <name>
disable [user or network] <name>
enable [user or network] <name>
```

You can view current configuration information with either the **show, list** or **show all** commands. List commands display table entries, show commands display information about a specific table or non-table entry. For example:

```
show network backbone
show user John
list networks
list services
list users
```

For a complete list of commands and options see the *Access Router Card Command Reference* manual. Also, you can access the on-line **help** command by typing:

```
help <command>
```

D ACRONYMS

This appendix lists acronyms used in the CommWorks Total Control 1000 Enhanced Data System application and documentation.

ABR Area Border Router

ACT Active

AH Authentication Header

AIS Alarm Indication Signal

ANI Automatic Number Identification

APS Automatic Protection Switching

ARC Access Router Card

ARP Address Resolution Protocol

ARQ Automatic Retransmission reQuest

AS Autonomous System

ASBR Autonomous System Boundary Router

ASE Autonomous System External

ATM Asynchronous Transfer Mode

AU High Path

AVP Attribute Value Pair

BACP Bandwidth Allocation Control Protocol

BAP Bandwidth Allocation Protocol

BBS	Bulletin Board Systems
Bc	Committed Burst Size
BDR	Backup Designated Router
Be	Excess Burst Size
BECN	Backward Explicit Congestion Notification
BERT	Bit Error Rate Testing
BLER	Block Errors
Bootp	Bootstrap Protocol
CBCP	Callback Control Protocol
CDR	Call Detail Records
CEM	Common Element Manager
CHAP	Challenge-Handshake Authentication Protocol
CIP	Call Information Process
CIR	Committed Information Rate
CLI	Command Line Interface
CRC	Cyclic Redundancy Check
CSU/DSU	Channel Service Unit/Digital Service Unit
CTS	Clear To Send
DS-1	Digital Signal, level 1
DS-3	Digital Signal, level 3
DES	Data Encryption Standard
DHCP	Dynamic Host Configuration Protocol

DHTML	Dynamic HyperText Markup Language
DLCI	Data Link Connection Identifier
DLL	Data Link Layer
DNIS	Dialed Number Identification Service
DNS	Domain Name Server
DPCM	Differential Pulse Code Modulation
DR	Designated Router
DSA	Dynamic Slot Assignment
DSP	Digital Signal Processor
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
DTS	Data Transformation Services
EEPROM	Electronically Erasable Programmable Read Only Memory
ESD	Electrostatic Discharge
ENFAS	Enhanced Network Facility Associated Signaling
EO	End Office
ESIG	Extended SIGnaling
ESP	Encapsulating Security Payload
EXZ	Excessive Zeros
FEAC	Far End Alarm and Control Channel
FEBE	Far End Block Errors
FECN	Forward Explicit Congestion Notification

FQ Fair Queuing

FRED Fair Random Early Drop

GMT Greenwich Mean Time

GSTN General Switched Telephone Network

HDLC High level Data Link Control

HiPer High Performance (CommWorks name for Total Control 1000 components not compatible with SDH 1.0)

ICMP Internet Control Message Protocol

IEA Internet Equal Access

IETF Internet Engineering Task Force

IGP Interior Gateway Protocol

IGMP Internet Group Management Protocol

INS In Service

IP Internet Protocol

IPX Internetwork Packet eXchange

ISAKMP Internet Security Association and Key Management Protocol

ISDN Integrated Services Digital Network

ISP Internet Service Provider

ITU-T International Telecommunication Union - Telecommunication Standardization Sector

L2TP Layer 2 Tunneling Protocol

LAC L2TP Access Concentrator

LAN Local Area Network

LAPM Link Access Procedure for Modems

LCV Line Code Violation

LED Light Emitting Diode

LIU Line Interface Unit

LMI Link Management Interface

LNS L2TP Tunnel Server

LOF Loss of Frame

LOS Loss of Signal

LSA Link State Advertisements

LSDB Link State Database

MAC address Media Access Control address

MBP Management Bus Protocol

Mbps MegaBits Per Second; million bits per second

MD5 Message Digest 5

MIB Management Information Base

MNP Microcom Networking Protocol

MPIP Multilink PPP Interspan Protocol

MPPE Microsoft Point-to-Point Encryption

MPPP Multilink Point-to-Point Protocol

MTBF Mean Time Between Failure

MTU Maximum Transmission Unit

MU Monitoring Unit

NAC Network Application Card

NAS Network Application Server

NAT Network Address Translation

NBMA Non-Broadcast Multi-Access

NIC Network Interface Card

NMC Network Management Card

NTP Network Time Protocol

NVRAM Non-Volatile Random Access Memory

OC-1 Optical Carrier, level 1, 52 Mbps

OC-3 Optical Carrier, level 3, 155 Mbps

OOS Out of Service (alternative acronym)'

OSPF Open Shortest Path First

OUS Out of Service

PAP Password Authentication Protocol

PAT Port and Network Address Translation

PCI Peripheral Component Interconnection

PCM Pulse Code Modulation

PDH Plesiochronous Digital Hierarchy

PM Performance Monitor

POP Point Of Presence

POST Power-on Self-test

PPP Point-to-Point Protocol

PPoE	Point-to-Point Protocol over Ethernet
PPTP	Point-to-Point Tunneling Protocol
PQ	Priority Queuing
PSI	Power Supply Interfaces
PSTN	Public Switched Telephone Network
PSU	Power Supply Unit
PTMPT	Point-to-Multipoint
PVC	Permanent Virtual Circuit
QoS	Quality of Service
RADIUS	Remote Authentication Dial-In User Service
RAI	Remote Alarm Indication
RAM	Random Access Memory
RAS	Remote Access Server
RFA	Remote Frame Alarm
RIP	Routing Information Protocol
RN/FL	Run/Fail
ROM	Read Only Memory
RRA	Return Route Assurance
RSHD	Remote Shell Daemon
RTP	Real Time Protocol
RTS	Request To Send
RX	Receive

SDH	Synchronous Digital Hierarchy
STM-0	Synchronous Transport Module, level 0
STM-1	Synchronous Transport Module, level 1
SABME	Set Asynchronous Balance Mode Extended
SAP	Service Advertising Protocol
SBY	Standby
SDH	Synchronous Digital Hierarchy
SDL-2	Software Download-2
SHA	Secure Hash Algorithm
SLAP	Signaling LAN Application Protocol
SLIP	Serial Line Internet Protocol
SNMP	Simple Network Management Protocol
SONET	Synchronous Optical Network
SS7	Signaling System 7
TCH	Total Control Hub (an alternative name for the Total Control 1000 chassis)
TCP	Transmission Control Protocol
TDM	Time Division Multiplex
TFTP	Trivial File Transfer Protocol
TTL	Time-to-Live
TX	Transmit
TU	Tributary Unit; Low Path
UDP	User Datagram Protocol

UI User Interface

VC-11 Virtual Container, number 11

VFPD Virtual Front Panel Display; Total Control Manager's graphical user interface

VLSM Variable Length Subnet Masks

VPN Virtual Private Network

VSA Vendor-Specific Attributes

VTP Virtual Terminal Protocol

WAN Wide Area Network

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