Lucent Technologies
Bell Labs Innovations

# BNS-2000
# Node Reference

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# Preface

The *Node Reference* is a compilation of material for node administrators, system installers, and other network personnel. This document includes the essential information on BNS-2000 and BNS-2000 VCS node configurations, installation, administration, and database creation, plus routine operations, maintenance, troubleshooting, and upgrades.

The *Data Networking Products Planning Guide*, this document, and individual reference documents for each module are designed to help node and network personnel obtain specific information as needed, with minimal overlap from document to document.

Complete descriptions of all commands are in the *Data Networking Products Commands Reference.*

## Important Notice

As of January 1997, Lucent Technologies is merging *Datakit* II VCS and MPC15 into one BNS-2000 hardware platform. The new name for *Datakit* II VCS is BNS-2000 VCS; the new name for the MPC15 is BNS-2000 MPC. Ordering will be simplified through the use of one (1) "J" drawing for initial orders. There will be different software for the BNS-2000 and BNS-2000 VCS but one (1) BNS-2000 documentation set that will include the necessary information for the BNS-2000, BNS-2000 VCS, and BNS-2000 MPC. Existing Datakit II VCS and BNS-2000 customers will receive the new documentation set when they purchase upgrades.

The BNS-2000 hardware platform will consist of the following options:

- *BNS-2000* — is the BNS-2000 M1/M2 cabinet configuration supporting both low-speed (M1) and high-speed (M2) modules. This configuration will require BNS-2000 software.
- *BNS-2000 VCS* — is the BNS-2000 VCS M1-only cabinet configuration supporting low-speed (M1) modules. The M1 cabinet will contain clock/repeater modules as opposed to CIM/CTRM modules contained in BNS-2000 M1 cabinets. M2 cabinets are not required. This configuration requires BNS-2000 VCS/Datakit II VCS R6.0 software.
- *BNS-2000 MPC* — is the BNS-2000 MPC M1 Multipurpose Concentrator cabinet configuration.

BNS-2000 Release 4.0 documentation will be updated to include information on the BNS-2000, BNS-2000 VCS, and BNS-2000 MPC.

All BNS-2000 offerings described above are managed by *StarKeeper* II Network Management System (NMS). (When configuring BNS-2000 VCS, customers select "Datakit II VCS" as the node option.)

BNS-2000 training courses will be updated to include information on the BNS-2000 VCS and BNS-2000 MPC offerings.

## Year 2000 Compliance

BNS-2000 Release 4.0, Build 57, and *StarKeeper* II NMS Release 9.0 provide *Year 2000 Compliance* through the support of four-digit years in most date fields; two digit years are also supported in an unambiguous way.

## Document Organization

The *Node Reference* describes the node and its components, and gives procedures for working with the hardware and software.

Included in this document are

- instructions for setting up and installing the hardware and software for specific configurations of the node
- guidance on starting up the system, including testing basic node operations; creating and maintaining a database; managing and monitoring the system; and performing diagnostics and basic maintenance
- checklists of tasks and procedures for installation, for the initial database configuration, for troubleshooting, and for upgrading hardware and software to the new release

In brief, the *Node Reference* contents are as follows:

| | |
|---|---|
| **Node Overview** | This chapter describes the hardware and software components of the node, including placement of cabinets/shelves, administrative interfaces, cabling, and software media. The chapter also briefly lists the main features, as well as the operational and security features,<br>of the node. |
| **Node Installation** | This chapter provides an overview of the tasks and procedures involved in installing the node hardware. It includes specific procedures for assembling the node cabinetry and for the required power connections for nodes in central office (CO) and other environments. Also included are instructions for installing modules in the front of the node; installing and cabling the appropriate input/output (I/O) distribution boards at the back of node; installing an internal or external tape drive; and cabling administrative interfaces, such as the system console and printer. |

| | |
|---|---|
| **Node Operations** | This chapter describes start-up and routine operating procedures, including switching to backup components. Included are instructions for installing the system software, setting the system time, backing up the database, checking the disk and tape, configuring the system for recovery, and rebooting. |
| **Node Administration** | This chapter gives a logical order for the steps a node administrator must take at system start-up to ensure that the node and administrative interfaces are installed correctly, to minimize interruptions once the system is booted, and to enable the orderly addition of information to the configuration database. The chapter also outlines the commands used to create a database, and gives instructions for entering information into the database to configure services and features. |
| **Node Maintenance** | This chapter covers the routine tasks associated with care and handling of the node equipment, and periodic preventive maintenance for fans, disk drives, tape drives, and battery backup components. |
| **Node Troubleshooting** | This chapter describes an overall approach to troubleshooting and then focuses on resolving problems associated with the node components. It covers node monitoring tasks, such as responding to system alarm messages, checking light-emitting diodes (LEDs), and running on-line diagnostic tests, and gives hardware and software troubleshooting procedures. |
| **Node Hardware and Software Upgrades** | This chapter gives a checklist of the basic steps involved in upgrading a Control Computer to the latest release, with specific instructions for upgrading node hardware and software, from one release to another release, or to a new build or compatible release of software. Also included are instructions for preserving and upgrading the database, rebooting the node to complete the upgrade, and backing out of a database upgrade when necessary. |
| **Appendix. Node Database Entry Forms** | This appendix includes forms for the node administrator to photocopy, fill in, and use when entering information into the configuration database; the forms are also useful for system record keeping. |
| **Index** | Entries cover subject matter in each chapter. |

# Document Conventions

This document describes two product nodes, the BNS-2000 node and the BNS-2000 VCS node. It describes two main Control Computer configurations: a new Control Computer Module (CCM) configuration and an ECPU configuration: the document uses *CCM system* and *ECPU system* to distinguish between the two configurations.

- All descriptions, instructions, and procedures apply to *both* configurations, unless the CCM or ECPU are specifically cited in the text.
- The **MRC>** system prompt used in the text refers to the maintenance and redundancy control functions of *both* the CCM configuration and the ECPU configuration (on an actual ECPU system, the prompt is seen as **MRCM>** ).

It also describes two types of switch complexes:

- The standard switch complex, which consists of the CMA1/CNA1/CMC3 circuit board complex, can be used in a BNS-2000 CCM or ECPU system. This switch system is referred to as *standard* in the document.
- The extended switch complex, which consists of the CTG13/CNA7/CUW1 circuit board complex, can also be used in a BNS-2000 CCM or ECPU system. This switch system is referred to as *extended* in the document.

Special typefaces are used to distinguish the information listed in the following table.

| Special Typefaces | |
|---|---|
| Commands in the text are shown in bold type | **enter** or **remove ty** |
| Optional or variable command parameters in the text are shown in italic type, enclosed in angle brackets | **help enter** <*object*> |
| Prompts and messages referred to in the text are shown in type similar to that seen on a screen | **UTILITY>** |
| Function or other keys such as Control are shown as | Control or Escape |
| The function key that you press to enter commands may be labeled ↵ or Enter or Ret, but is shown as | Return |
| Directory and file names are shown in italic type | */bin/mini-sh* |
| General information that appears in screen output—such as the product name, the date and the time, or the release revision level—is shown in italic type. | <*month, day, year*> |

Each term, module, or component name is spelled out with its acronym or abbreviation given in parentheses at the first use in the text. Thereafter, only the acronym or abbreviation is used.

## Related Documentation

*Data Networking Products Publications* describes the complete set of documentation available for the product line;  see the inside front cover of this volume for ordering information.

Documents you will need to use with this reference include:

- *Data Networking Products Commands Reference*—a complete reference document, with sample screen output, for the administration commands used with the system.
- *Data Networking Products Planning Guide*—information required to plan and configure a network of node switches
- *Data Networking Products Messages Reference*—detailed descriptions of system messages with suggestions for the appropriate response or troubleshooting, for all node and network personnel
- *BNS-2000 SMDS Guide*—for systems using switched multimegabit data service (SMDS)
- *Data Networking Products Session Maintenance Guide*—for systems using automatic alternate routing

In addition, reference guides for interface and trunk modules and for concentrators supported by the system are available; certain documents from other vendors may also be necessary for end devices connected to the modules.

The *BNS-2000 System Description* gives an overview of specific BNS-2000 and BNS-2000 VCS features as well as hardware and software components—from the perspective of the release's data services and related capabilities.

The *Data Networking Products Terminology* publication lists the acronyms and abbreviations used in the customer document library and briefly defines many technical terms.

# Technical Assistance and Node Registration

Before working with the node, become familiar with how to get technical assistance when it is required. You can also save time by obtaining the software registration key to make the release software and feature packages fully operational, in advance.

## Calling a Telephone Hotline

Telephone hotline assistance is available for node operations and administration. If problems cannot be resolved by local action, technical personnel may be dispatched to your site.

For information on the technical assistance and support services available, see the *System Description.*

The information given below describes the available hotline numbers, the account and technical information you should gather before calling a hotline, and how to escalate problems.

Your account representative will advise which telephone number to call.

| Telephone Hotline and Node Registration Numbers | |
|---|---|
| Canada | 1-800-343-1958 |
| Germany | 0130810992 |
| Italy | 167870510 |
| Japan | 0031111399 |
| Mexico | 95 800 010-0072 |
| The Netherlands | 060224285 |
| South Korea | 008 1 800 921-8260 |
| United Kingdom | 0 800 891760 |
| USA | 1-800-WE-2-CARE (1-800-932-2273) |

Before calling for assistance from a hotline, collect the information in the following table.

**TABLE 1. Information Needed for the Hotline Operator**

| | |
|---|---|
| **Name** | |
| **Telephone** and **FAX numbers** | |
| **Company name** | |
| **System** or **product name** | |
| **Software release number**<br>(For all nodes involved in the configuration) | |
| **Type of node system**<br>(CCM or ECPU) | |
| **Type of switch complex**<br>(standard or extended) | |
| **Service Contract** or **Purchase Order number** | |
| **Network**, **node**, and/or **application configurations**<br>(For information, at the **CC0>** or **CC1>** prompt, type **verify** <*node, shelf, module, group, address*> for BNS-2000 nodes or **verify** <*node, module, group, address*> for BNS-2000 VCS nodes.) | |
| **Status reports for virtual circuits involved**<br>(Type **display** <*connections, circuits, eia*>, **dmeas**, and **dstat** at the **CC0>** or **CC1>** prompts.) | |
| **Messages received when performing diagnostics**<br>(For exact text of messages, type **diagnose** commands at the **CC0>**, **CC1>**, **MRC>**, **or MRCM> prompts; by typing di** at the **MONITOR>** prompt; and by typing **run diag** at the **LOADER>** prompt. Print and attach the messages to this form.) | |

**TABLE 1. Information Needed for the Hotline Operator** (continued)

| | |
|---|---|
| **Name** | |
| **Other console messages or alarms** (Print and attach to this form the exact text of messages or alarms related to problem.) | |
| **Recent configuration changes**, **relevant problems**, and **machine usage data** (Attach records to this form.) | |
| **Problem or question** (Include impact on users at the site.) | |
| **Severity of call** (Obtain code number from the following table.) | |

To assess the severity of a node or system problem before calling the hotline, use the following table. Problem descriptions are coded from 1 (the most severe) to 4; these codes help the hotline consultant deal with the nature and urgency of system problems.

| Severity Codes for System Problems | | |
|---|---|---|
| **Code** | **Problem** | **Description** |
| 1 | Major system failure | The node, network, or critical application is inoperative. The user environment is currently adversely affected, or will be adversely affected within 24 hours. The appropriate customer resources will be made available to the hotline support staff while the problem or request is being worked. |
| 2 | Partial system failure | A critical service-affecting feature of the node, network, or application is inoperative, or the customer cannot commit the appropriate resources to resolve the problem or request. The user environment is not currently adversely affected, but may be adversely affected within 5 business days. |
| 3 | Inoperative or missing feature | Of the system, network, or application. The effect is not critical; users will not be adversely affected, but a solution is required. |
| 4 | All other problems | These may involve system enhancements, comments or requests on the user documentation, and other service requests. |

## Escalation Procedure

If you are concerned about the rate of progress in resolving a problem, escalate the problem to the hotline management simply by calling the hotline and requesting escalation. Have the associated trouble report (TR) or trouble ticket number, previously given to you by the hotline, available.

## Registering the Node

To make the release software fully functional on the node, you must enter a software registration key using the **install registration** command. This key is obtained from the Customer Assistance Center (CAC) at: **1-800-WE-2-CARE**. (Customers outside the USA should call their supplier or regional support organization.) Before calling 1-800-WE-2-CARE, you will need the information listed in the following form.

**TABLE 2. Information Needed When Calling for Software Registration Key**

| | |
|---|---|
| **Company name**<br>(Owner of hardware and software.) | |
| **Node administrator's name** | |
| **Node administrator's telephone**<br>and **FAX numbers**<br>(Include area code.) | |
| **Node administrator's address**<br>(Include zip code.) | |
| **Location of hardware**<br>(Address and zip code.) | |
| **Serial number of Control Shelf**<br>(Obtain from barcode on back of shelf.) | |
| **Number of Series M2 Extension Shelves** | |
| **Number of Series M1 Control Shelves** | |
| **Number of Series M2 Port Shelves** | |

**TABLE 2. Information Needed When Calling for Software Registration Key** (continued)

| | |
|---|---|
| **Software release number**<br>(Obtain from tape label.)<br>*Example:* 2BN4.0 for BNS-2000 VCS.<br>*Example:* 3VS6.0 for BNS-2000 VCS nodes. | |
| **Software build number**<br>(Obtain from tape label.) | |
| **Node identifier**<br>(The serial number of the SCSI/DKI module or CCM in Control Computer 0.<br>Obtain the number using **dstat** <**mod**>.<br>(*Example:* 12345) | |
| **Software serial number**<br>(Obtain from barcode label on tape.) | |
| **Software Feature Package Activation Identifier(s)**<br>(Obtain from the red feature card(s) for each software feature package ordered.)<br>*Example:* **a6be-76yiX** | |
| **Software registration key**<br>(The CAC will supply:<br>**1-800-WE-2-CARE** in the USA.) | |

After receiving the information in the form, the CAC specialist will give you a software registration key. Record this key for later use with the **install registration** command. The procedure for using the **install registration** command to enter the software key and install feature packages is given in the **Node Operations** chapter. Once the software registration key is entered in the database, it is not needed again during normal node operations.

*Re-entering the key is required when*

- the disk drive is replaced
- the disk is reformatted
- the data saved prior to registering the node is retrieved

*A new key is required when*

- a new software release is installed
- a new software build is installed
- a new feature package is installed
- a Control Computer Module (CCM) or SCSI/DKI module is replaced

The following figures show the location of the serial number on the CCM, or SCSI/DKI module (ECPU system). The serial number can also be obtained from the **dstat <mod>** report for the CCM or SCSI/DKI module.

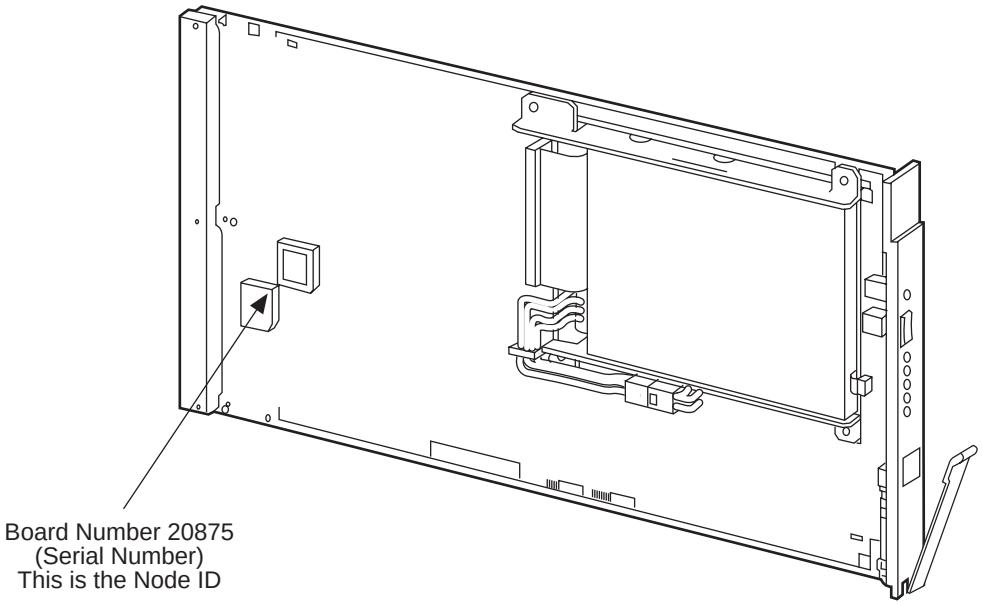



**FIGURE 1. Node ID Number on Control Computer Module (CCM)**

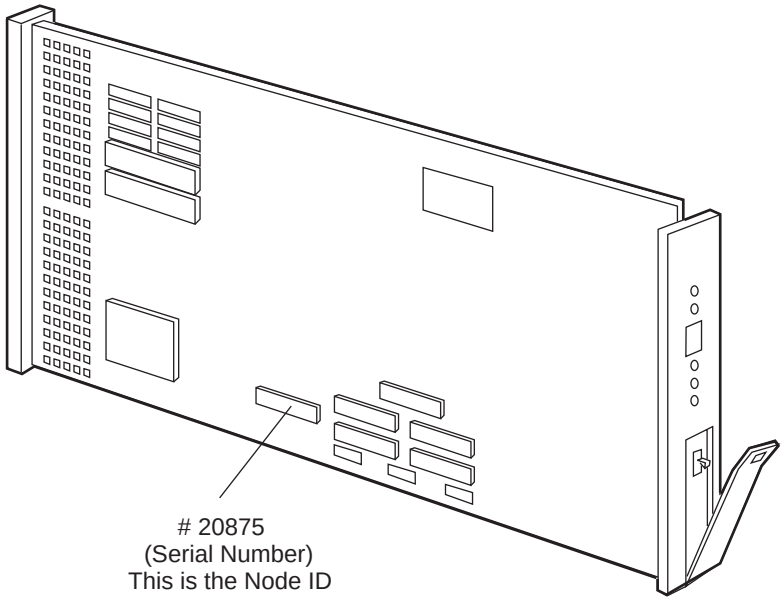



**FIGURE 2. Node ID Number on SCSI/DKI Module in an ECPU System**

With each Software Feature Package, you will receive a Red Feature Card that shows the software Activation Identifier code. Accompanying the card is a notice titled "READ ME FIRST!!" that gives instructions for registering software. Save the notice and the Red Feature Card for future use. The following figures show these sample feature cards.

Comcode 107219784

**READ ME FIRST!!**
**BNS-2000 Software Registration Notice**

When installing a BNS-2000 node for the first time, you must register the software prior to having it become fully functional. If instead, you have recently purchased a software feature package to add to your node, you need to re-register your node software, making the new feature package functional.

In order to register software on a BNS-2000 node, you must execute the *install registration* command. Successful execution of this command requires a Software Registration Key from the Customer Assistance Center (CAC) at 1-800-WE2-CARE. Node functionality will be blocked until the registration procedure is successful.

Each BNS-2000 node has a unique Software Registration Key which is a function of the Node Identifier, Software Release Number, Software Build Number, and Activation Identifier(s). Prior to calling the CAC, execute the *install registration* command on your node and take note of the following values:

- Node Identifier
- Software Release Number
- Software Build Number

Activation Identifier(s) are obtained from the RED Feature Card(s) which accompany this notice. The number of feature cards you receive for each node depends on the number of feature packages ordered. (Note that the Full Feature Package consists of a single feature card.) When you call the CAC to obtain a software key, make sure you have all feature cards for a particular system.

Once you receive the Software Registration Key from the CAC, execute the *install registration* command and enter the key. The key will be stored in the node software and the node will become fully operational. The key is not needed again during normal operations; however, it is good practice to save it. You would need to re-enter the key if the disk was replaced or reformatted.

When a new software release is installed on a node, a new key will be required. Replacing the CCM board would also require a new software key.

When calling the CAC to obtain your Software Registration Key, you will be asked for some additional information which will enable us to serve you better in the future. Please take some time to fill out the back of this form prior to calling the CAC for your registration key.

**Please save this notice, along with all RED Feature Cards, in a safe place for future use.**

**FIGURE 3. BNS-2000 Software Registration Notice Card**

COMCODE: 107761918

BNS-2000 Feature Card
**FULL**
**FEATURE PACKAGE**

**DO NOT DISCARD!**

Software Release Number: 2BN4.0
Activation Identifier: jrr7-awa6n
Node Identifier:

This Activation Identifier enables you to activate this feature package for one node. Follow these steps:

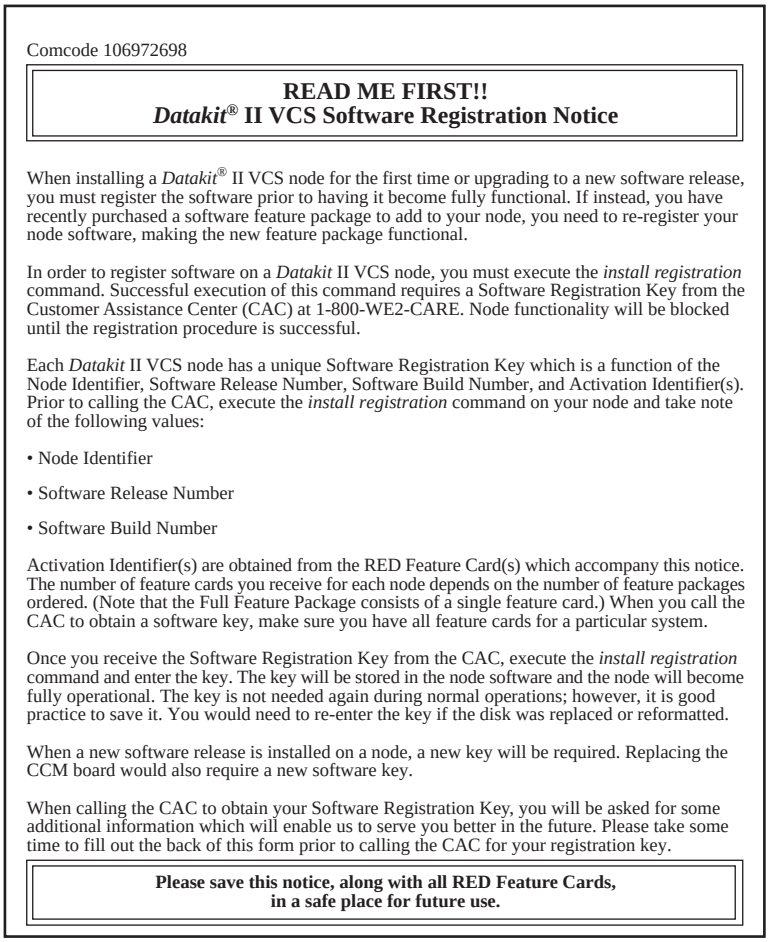
1.) Run the "install registration" command and take note of the following: Software Release Number, Node Identifier, and Software Build Number.

2.) Call the AT&T Customer Assistance Center with this information and receive a Software Registration Key. Phone 1-800-WE2-CARE.

3.) Enter the Software Registration Key on the node using the "install registration" command.

01/95-B SERIAL NUMBER: BNS-2000/4.0/15/0412

**FIGURE 4. BNS-2000 Sample Feature Card with Activation ID**



Comcode 106972698

**READ ME FIRST!!**
***Datakit*® II VCS Software Registration Notice**

When installing a *Datakit*® II VCS node for the first time or upgrading to a new software release, you must register the software prior to having it become fully functional. If instead, you have recently purchased a software feature package to add to your node, you need to re-register your node software, making the new feature package functional.

In order to register software on a *Datakit* II VCS node, you must execute the *install registration* command. Successful execution of this command requires a Software Registration Key from the Customer Assistance Center (CAC) at 1-800-WE2-CARE. Node functionality will be blocked until the registration procedure is successful.

Each *Datakit* II VCS node has a unique Software Registration Key which is a function of the Node Identifier, Software Release Number, Software Build Number, and Activation Identifier(s). Prior to calling the CAC, execute the *install registration* command on your node and take note of the following values:

- Node Identifier
- Software Release Number
- Software Build Number

Activation Identifier(s) are obtained from the RED Feature Card(s) which accompany this notice. The number of feature cards you receive for each node depends on the number of feature packages ordered. (Note that the Full Feature Package consists of a single feature card.) When you call the CAC to obtain a software key, make sure you have all feature cards for a particular system.

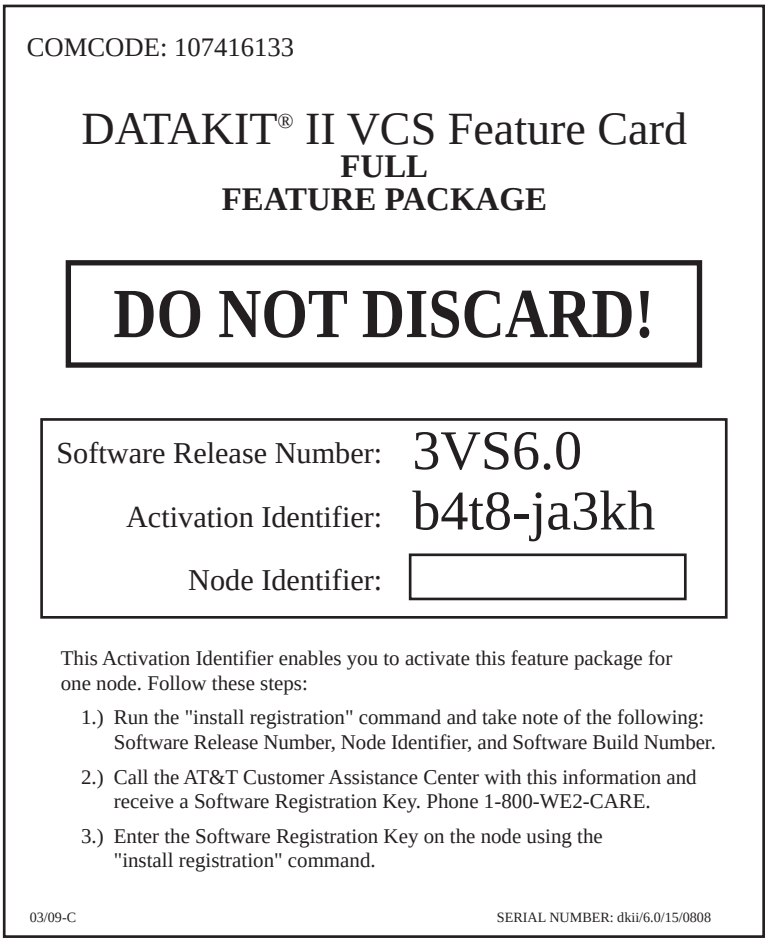
Once you receive the Software Registration Key from the CAC, execute the *install registration* command and enter the key. The key will be stored in the node software and the node will become fully operational. The key is not needed again during normal operations; however, it is good practice to save it. You would need to re-enter the key if the disk was replaced or reformatted.

When a new software release is installed on a node, a new key will be required. Replacing the CCM board would also require a new software key.

When calling the CAC to obtain your Software Registration Key, you will be asked for some additional information which will enable us to serve you better in the future. Please take some time to fill out the back of this form prior to calling the CAC for your registration key.

**Please save this notice, along with all RED Feature Cards, in a safe place for future use.**

**FIGURE 5. BNS-2000 VCS Software Registration Notice Card**


COMCODE: 107416133

DATAKIT® II VCS Feature Card
**FULL**
**FEATURE PACKAGE**

**DO NOT DISCARD!**

Software Release Number: 3VS6.0
Activation Identifier: b4t8-ja3kh
Node Identifier:

This Activation Identifier enables you to activate this feature package for one node. Follow these steps:

1.) Run the "install registration" command and take note of the following: Software Release Number, Node Identifier, and Software Build Number.

2.) Call the AT&T Customer Assistance Center with this information and receive a Software Registration Key. Phone 1-800-WE2-CARE.

3.) Enter the Software Registration Key on the node using the "install registration" command.

03/09-C SERIAL NUMBER: dkii/6.0/15/0808

**FIGURE 6. BNS-2000 VCS Sample Feature Card with Activation Identifier**

# Node Overview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# Node Overview

The node provides the services required for asynchronous and synchronous data transfers needed for local area networks (LANs), as well as domestic and international private and public wide area networks (WANs). A node can be configured with two types of shelf combinations:

- A ***BNS-2000 node*** is configured with a combination of Series M2 Shelves and Series M1 Shelves; it has a 200 Mb backplane. The switching function is located in a separate Series M2 Shelf. It generates and repeats timing signals through one board, which is located in a Series M1 Shelf.

  A BNS-2000 node is a fast-packet switching product that provides the high-speed services required for local area network (LAN) interconnect via Frame Relay, and for interworking with devices that comply with the Switched Multimegabit Data Service (SMDS) definition and the Institute for Electrical and Electronics Engineers (IEEE) 802.6 standard for metropolitan area networks (MANs). The node can serve as a platform to support a BNS-2000 SMDS network.

  An implementation of Asynchronous Transfer Mode (ATM) technology, the node switches data in the cell format used in IEEE 802.6 and SMDS. This technology supports dedicated high-bandwidth, high-capacity data switching.

- A ***BNS-2000 VCS node*** is configured with a combination of one or more Series M1 Shelves; it has an 8 Mb backplane. The switching function is located on a board that resides in the Series M1 Shelf. It generates and repeats timing signals through two separate boards, which are located in a Series M1 Shelf.

  A BNS-2000 VCS node interconnects host computers, terminals, modems, printers, and other data processing devices for communication over short and long distances. In addition, it serves as a platform for interworking with other Lucent Technologies nodes and for internetworking with LAN/WAN segments, including access to packet switched networks worldwide.

The Series M1 Shelves of both BNS-2000 and BNS-2000 VCS nodes can be configured with two types of Control Computers in single and redundant schemes:

- For the BNS-2000 and BNS-2000 VCS nodes, a ***Control Computer Module (CCM)*** system contains the following modules and their associated I/O boards: a Control Computer Module (CCM) with or without remote maintenance and redundancy control capabilities—which is provided by a Maintenance and Redundancy Control (MRC) function—a Clock/Trunk/Repeater Module (CTRM), plus a digital data storage (DDS) tape drive (which can reside in an internal slot or be external).

- For a BNS-2000 node, the ***ECPU*** system contains the following modules and their associated I/O boards: a Control Computer including a CTRM, a Disk/Tape Subsystem, and a Maintenance and Redundancy Control Module (MRCM) when a redundant Control Computer is used.

  For a BNS-2000 VCS node, the ECPU system contains the following modules and their associated I/O boards: the Control Computer, including a Switch, a Clock, and a Repeater module, along with a Disk/Tape Subsystem and a Maintenance and Redundancy Control Module (MRCM) when a redundant Control Computer is used.

BNS-2000 nodes running CCM or ECPU systems can be configured with two types of switch complexes: the ***extended***—which includes the STR4 Stratum Clock—or the ***standard***, which includes the SSM4 Stratum Clock. Either switch complex resides in the Series M2 Switching Shelf.

# Physical Description

The BNS-2000 and BNS-2000 VCS nodes have a modular architecture, which allows for installation of cabinets at central or separate physical locations. This modular architecture also allows for cabinet-by-cabinet configuration of node services. A node has control, switch, and administrative interface functions, and provides interface capabilities for asynchronous, synchronous, multiplexed host, X.25/X.75, and high-speed frame relay services.

Redundant control and switching capabilities are optional. The sections that follow describe the node, and its central hardware and software components.

## Architecture

The shelves in a BNS-2000 or BNS-2000 VCS node configuration are interconnected to allow the various interface and trunk modules to transfer information. The interconnection method differs according to the shelves used in the configuration:

- A BNS-2000 node is configured with Series M2 and Series M1 Shelves interconnected via the Series M2 Switch Shelf as the center of the configuration. This architecture configuration is known as a *star topology*. The star topology of a BNS-2000 system has the 200 Mbps cell relay-based switch complex at the center. This switch complex is connected to a combination of shelf types designed for high-speed data switching and for centralized node control and management. Two types of switch complexes can exist in a Series M2 Switch Shelf: the ***extended***—which includes the STR4 Stratum Clock—or the ***standard***, which includes the SSM4 Stratum Clock.

  As the following two figures show, the star architecture of BNS-2000 nodes can assume various combinations of Series M1 and Series M2 Shelves. The minimum configuration consists of one Series M2 Switch Shelf and one Series M1 Control Shelf.

  Refer to sections later in this chapter for more detailed explanations of BNS-2000 shelf configurations.

A ***standard*** shelf configuration, as shown in the following figure, could consist of the required Series M2 Switch Shelf and Series M1 Control Shelf, another optional Series M1 Control Shelf, two optional Series M1 Port Shelves, and three optional Series M2 Extension Shelves. (The three Series M2 Extension Shelves are the maximum number of extension shelves that can be added for this type of standard shelf configuration.)

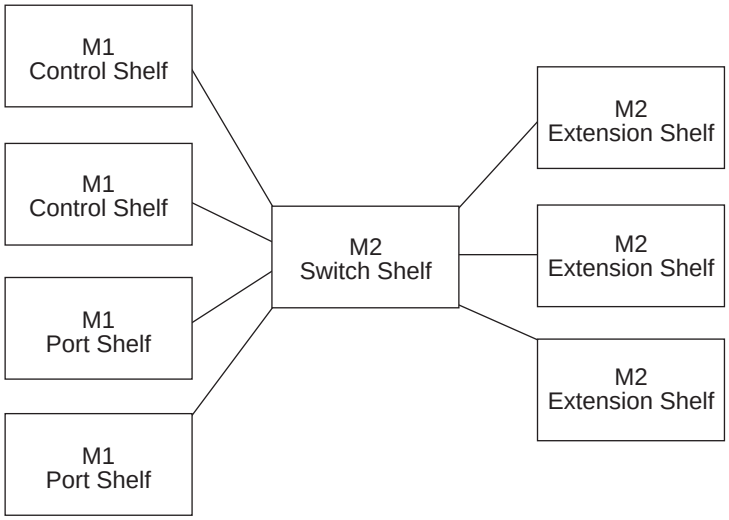



**FIGURE 1-1. BNS-2000 Standard Star Architecture Example**

An ***extended*** shelf configuration, as shown in the following figure, could consist of the required Series M2 Switch Shelf and Series M1 Control Shelf, another optional Series M1 Control Shelf, and five optional Series M2 Extension Shelves. (The five Series M2 Extension Shelves are the maximum number of extension shelves that can be added for this type of switching module complex, which is referred to as the ***extended*** switch complex.)

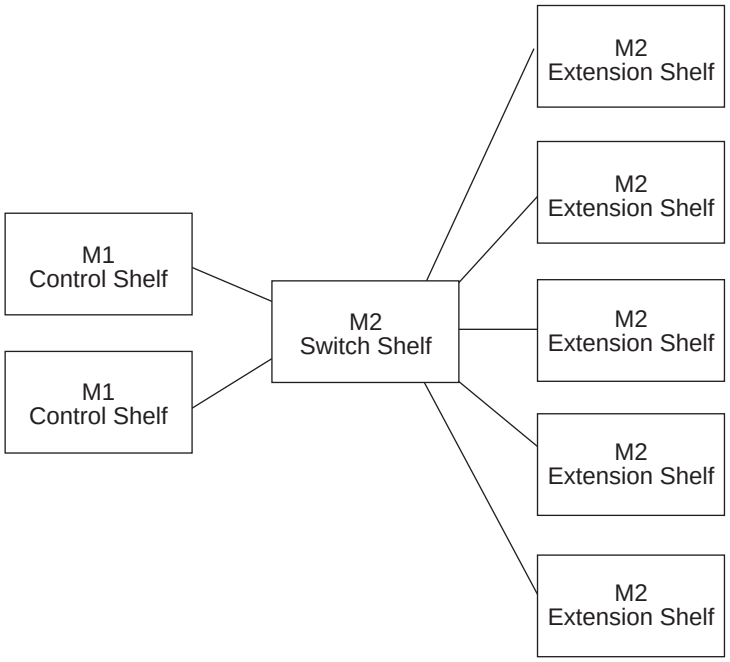



**FIGURE 1-2. BNS-2000 Extended Star Architecture Example**

- A BNS-2000 VCS node is configured with one or more Series M1 Shelves interconnected via a common communications bus. This configuration is known as *bus architecture*.

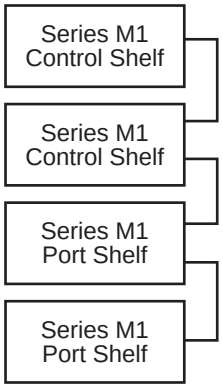



**FIGURE 1-3. BNS-2000 VCS Bus Architecture**

## Node Cabinetry

A node can be configured with the following combinations of types of shelves:

- A BNS-2000 node must contain one Series M2 Switch Shelf and one Series M1 Control Shelf. Up to five Series M2 Extension Shelves or up to seven Series M1 Shelves (including Control Shelves) can be added. However, the total number of shelves in a node is limited to eight.

  BNS-2000 node configurations with up to three Series M2 Extension Shelves use the ***standard*** switch complex along with multi-coax intershelf cabling. When the standard configuration of three extension shelves is upgraded to the maximum configuration of five Series M2 Extension Shelves, the ***extended*** switch complex and high density intershelf cabling are required.

  **NOTE:** BNS-2000 node configurations that include the Stratum 4 Clock upgrade also require the extended switch complex.

- A BNS-2000 VCS node must contain one Series M1 Control Shelf. Each node can have a maximum of eight Series M1 shelves.

Each node can be configured with a variety of modules (plug-in circuit packs), depending on switching and service requirements; see the *Planning Guide*.

The central office (CO) environment requires that node cabinets be stacked and wired in a CO frame, and includes additional components, such as the Alarm Relay Unit (ARU). The ARU is mounted in a special slot at the top of the CO frame and connected to the Series M1 Control Shelf.

Series M2 shelves are designed for placement of modules in horizontal slots; Series M1 shelves are designed for placement of modules in vertical slots. Switching, control, interface, or trunk modules are located in slots in the front of each shelf. Shelf slots are designated by numbers that identify module *addresses* in the node database. Within each shelf, the backplane carries data, timing and contention signals, and power to the input/output (I/O) distribution boards associated with the modules.

All processing and interface functions in the node are performed by the modules. Most modules have associated I/O boards that plug into pin fields on the rear of the backplane. The I/O boards connect the modules to compatible user equipment or to other modules. Modules are available in the following categories:

- *Switch Shelf modules*—provide clock and switching functions which control the node backplane signals and data transport for BNS-2000 nodes with 200 Mb backplanes.
- *Control Shelf modules*—include the processor, disk and tape, and remote maintenance capabilities for all BNS-2000 nodes; and for BNS-2000 VCS nodes, they also include the Clock, Switch, and Repeater modules.
- *interface modules*—control communication with devices such as terminals and host computers connected to the local node and the switching network
- *trunk modules*—communicate with other nodes or multiplexers and concentrators.

The figures in this chapter illustrating the shelves show the slots reserved for specific modules; the unreserved slots can contain additional control, interface, or trunk modules, depending on the shelf functions.

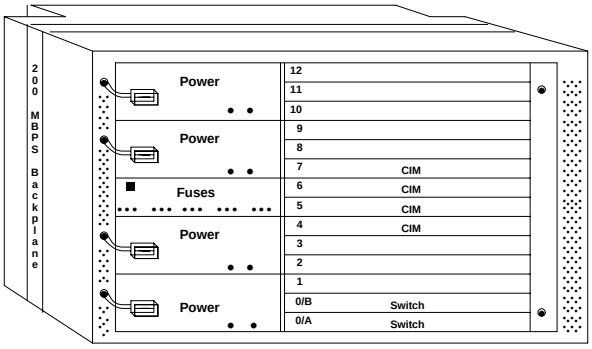
The overall unloaded weight of a Series M1 shelf is approximately 100 pounds and of a Series M2 shelf about 175 pounds.

### Series M2 Switch Shelf

The switching function of the BNS-2000 node is managed by the Series M2 Switch Shelf. It is here that data is routed through the network and all call addresses are retained in memory for the duration of a call. The bus in the Switch Shelf provides 200 Mbps of bandwidth for transport of variable length (1 through 44 octets) segments of data. The data rate is approximately 460,000 full segments per second.

The Series M2 Switch Shelf can contain up to seven Cabinet Interface Modules (CIMs) for fiber connections to Clock/Trunk/Repeater Modules (CTRMs) residing in 8 Mbps Series M1 Control or Port Shelves. The CIM provides translation between cell segments and Universal Receiver Protocol (URP) packets. Each CIM module in the Switch Shelf requires a CMC2 I/O board.

The Switch Shelf has 14 horizontal physical slots.




**M2 Switch Shelf (Front)**

**FIGURE 1-4. BNS-2000 Series M2 Switch Shelf**

The Series M2 Switch Shelf supports two switch configurations, which are dependent upon the number of Series M2 Shelves used in the configuration and the type of Stratum 4 Clocking required.

Both configurations require two switch modules—an active module and a standby that mirrors the memory of the active. The node is automatically configured for a single Switch module when the system is powered up. After the second Switch module is configured and put into service, if the active Switch module fails, the standby is automatically switched to active status, and the failed Switch module will be put out of service.

***Standard Switch Complex (CMA1/CNA1/CMC3).*** The standard switch complex is used with configurations that have a maximum of three Series M2 Extension Shelves or require Stratum 4 clocking and synchronization without separately replaceable Reference Input Boards (RIBs) and Synchronization Units (SUs). The standard switch complex is composed of three or four circuit packs, depending on the presence of a redundant switch module. It occupies Slots 0/A and 0/B. This switch complex consists of the following:

- The *CMA1 Switch Module* — can be used in pairs for redundancy. The Switch module uses the CNA1 Intershelf Cable/Clock (ICC) I/O board. The CNA1 has connectors for up to three Series M2 Shelves. The redundant Switch module is located in the slot in front of the Stratum 4 Clock (the CMC3 I/O board).

  The Switch modules must be placed in physical slot 1 (logical slot 0/A) and physical slot 2 (logical slot 0/B) in the Series M2 Switch Shelf.

- The *CMC3 Stratum 4 Clock (SSM4)* — uses the CMC3 I/O board located at the rear of the node in physical slot 2 (logical slot 0/B). The CMC3 has two External Reference Input connectors, plus status and debugging connectors.

  The SSM4 provides synchronization for the primary and secondary timing references on an SMDS-connected node. The CMC3 also provides status reports for conditions such as power supply failure, fan failure, or high temperature for the Series M2 Shelves.

***Extended Switch Complex (CTG13/CNA7/CUW1).*** The extended switch complex is used with configurations that have a maximum of five Series M2 Extension Shelves and require extended Stratum 4 clocking and synchronization. Extended Stratum 4 clocking and synchronization includes separately replaceable Reference Input Boards (RIBs) and Synchronization Units (SUs).

A fully configured Extended Switch Complex (meaning, those configurations with a redundant switch) consists of circuit packs that include the following:

- The *CTG13 Extended Switch Module* — has integrated Stratum 4 Clock (STR4) synchronization units. The primary CTG13 switch module resides in Slot 0/A; the redundant CTG13 switch module resides in Slot 0/B.

- The *CNA7 Extended Cable/Clock and RIB Status I/O Board* — has status and debug connectors, along with slots and connectors for two separately replaceable reference input boards (RIBs). The CNA7 also has five connectors for high density intershelf cables that connect to Series M2 Extension Shelves, numbered 1, 2, 3, 6, and 7.

  Along with its module board—the CTG13—the CNA7 resides in Slots 0/A and Slot 0/B.

- The *CUW1 RIB* supports T1, E1, or 64KCC functions. Both RIBs must support the same function type. Each RIB has two LEDs, one green and one red. See **Node Troubleshooting** for an explanation of LED states.

### Series M2 Extension Shelf

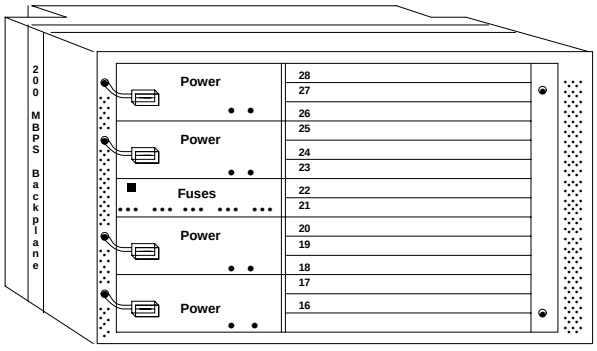
The Series M2 Extension Shelf, with 14 horizontal physical slots, is designed for high-speed interface modules. A node with a Standard Switch Complex can have up to three Series M2 Extension Shelves, which are numbered 1, 2, and 3. A node with an Extended Switch Complex can have up to five Series M2 Extension Shelves, which are numbered 1, 2, 3, 6, and 7.

Series M2 Switch and Series M2 Extension Shelves are identical; however, Extension Shelves use an Extension Intershelf Shelf Cable/Clock (ECC) I/O board in place of the CNA1:

- For a standard switch complex, the CNA2 ECC I/O board goes in the back of physical slot 1. It connects to one of the three ports on the CNA1 board in the Series M2 Switch Shelf.
- For an extended switch complex, the CNA8 Enhanced Extension Cable/Clock I/O Board goes in the back of physical slot 1. It connects to one of the five ports on the CNA7 board in the Series M2 Switch Shelf.

**NOTE:** When upgrading nodes to the extended configuration, see the *Planning Guide*.

All remaining slots are available for high-speed modules. These modules can reside in any slots not occupied by ECC I/O boards in shelves numbered 1, 2, 3, 6, or 7. With extended configurations, GAR and all Series M2 trunk modules can only reside in shelves numbered 1, 2, and 3.



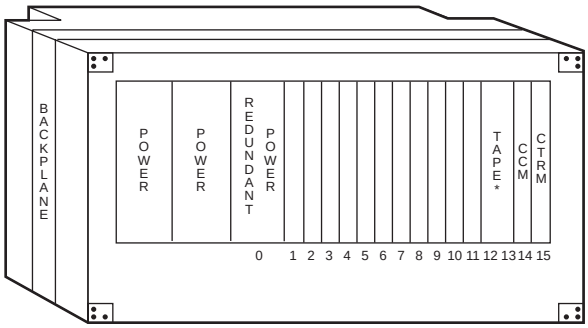

**Series M2 Extension Shelf (Front)**

**FIGURE 1-5. BNS-2000 Series M2 Extension Shelf**

### Series M1 Control Shelf

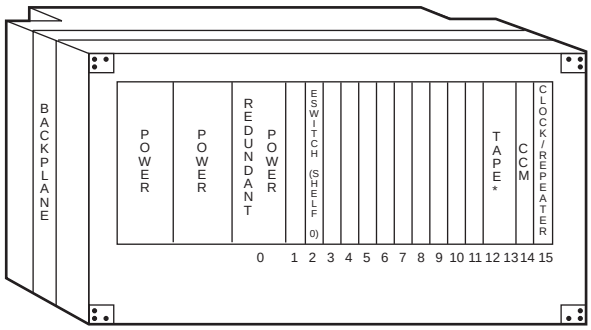
The entire node is controlled by a Control Computer that resides in a Series M1 Control Shelf, or dual Control Computers (one active, one standby) that reside in one or two Series M1 Control Shelves. The Series M1 Control Shelf, with an 8 Mbps backplane, has 16 vertical physical slots for modules. For greater reliability, an optional redundant Control Computer can provide backup to the first. The redundant Control Shelf must be located in a shelf with a higher number than the primary Control Shelf.

The Control Computer configurations supported in the Series M1 Control Shelf are the CCM system and the ECPU system. Each is described in this section.




* Tape drive can be external.

**FIGURE 1-6. BNS-2000 Series M1 Control Shelf**




* Tape drive can be external.

**FIGURE 1-7. BNS-2000 VCS Series M1 Control Shelf**

***CCM System.*** The Control Computer Module system consists of a Control Computer Module (CCM) with or without remote maintenance and redundancy control capabilities, a DDS tape drive (which can reside in an internal slot or be external), and associated I/O boards.

A CCM system must contain a module that generates and repeats timing signals between shelves. In a BNS-2000 node, the timing and repeater functions, along with status polling, are combined in one module, which is the Clock/Trunk/Repeater Module (CTRM). In a BNS-2000 VCS node, the timing and repeater functions are performed in two separate modules, which are the Clock and Repeater modules.

In addition, the switching function in a BNS-2000 VCS node is performed as a function of the CCM system. (It is unlike the BNS-2000 node whose switching function is performed in the Series M2 Switch Shelf.) Therefore, the CCM system in a BNS-2000 VCS node must contain a Switch module.

When a redundant Control Computer is used, a second CCM may be placed in the same physical cabinet or in any adjacent cabinet, and must include remote maintenance capabilities.

- *CCM*—provides on-board random access memory (RAM), dual SCSI buses, and a hard disk containing the node software and database. The CCM runs the call control and system management software. It communicates with other Control Computer and interface modules.

  The CCM sets up, responds to, and takes down calls, establishing the route that data from a sender will take. It also receives the status poll of interface modules and prints warnings of module failure.

  The hard disk on the module board contains all the software required for node operations, including on-line operational software, off-line diagnostic software, and the configuration database that records customer and node parameters. The disk is used for booting the system and saving configuration data.

  The administrative interfaces (console and printer) to the node are connected to one of two available I/O boards for the CCM:

  — CTS1 (MRC I/O board)—supports remote maintenance and redundancy control functions; it is optional with a single CCM and required with dual CCMs to ensure that only one is active at any time. The MRCIO can switch to the standby when the active Control Computer fails, and can reboot either Control Computer remotely.

    The MRCIO also provides the following: access, communication, and control for two interconnected Control Computers; and an optional multiport interface for activities from a remote console, including access, reboot, reset, administration, and maintenance for single or dual Control Computers. This I/O board plugs into the backplane of a Control Computer cabinet and makes connections to other modules and to external devices. The board supplies three RS-232-C ports. Ports A, B, and M provide external I/O ports to which data terminal equipment (DTE) can connect for communication with the Control Computer; these ports are called *workstation* or *console* ports. Consoles and printers connected directly to ports A and B on the CTS1 are dedicated to the Control Computer:

    — *port A* can be connected to the local console (administrative console) or to an asynchronous port on an asynchronous interface module.

— *port B* can be connected to a printer or to a remote console for access via the *StarKeeper*® II Network Management System (NMS) or the Total Network Management (TNM) system.

— *port M* (the maintenance port) can connect to any of the Control Computer ports, or it can be used for local console access, for direct administration of the MRCIO, and for remote administration of the active or standby Control Computer; port M is connected to a local terminal or a modem. It can also be connected to *StarKeeper* II NMS.

— CTS2 (controller I/O board)—is used for a Control Computer with a single CCM that does not require remote maintenance or remote control features, and for a second CCM in a redundant configuration.

Consoles and printers connected directly to ports A and B on the CTS2 are dedicated to the Control Computer; see the port A and B descriptions above.

- *DDS tape drive*— used to install the release software, which is delivered on a tape, onto the fixed disk and to run off-line utility programs and fixed-disk diagnostics. This tape drive can be internal or external. Additional DDS tapes are used to store the configuration database off-line.
- *Clock/Trunk/Repeater Module (CTRM)* in a BNS-2000 node— resides in the highest slot of each Series M1 Control or Port Shelf and provides interconnection between Series M1 Shelves and the Series M2 Switch Shelf. Each CTRM requires an ASP7B I/O board, and is connected to a CIM in the Series M2 Switch Shelf.

  The CTRM, which includes an internal repeater function, generates timing signals for the shelf, polls each module in the shelf for status, and reports the hardware status of the shelf. If the CTRM fails, the shelf in which it resides also fails.
- *Clock module* in a BNS-2000 VCS node—which includes an internal repeater for the cabinet the Clock is in, generates timing signals for the backplane and Repeater modules, and polls each module on its node, or Multipurpose Concentrator (MPC), for status. The Clock is a critical module; if it fails, the node also fails.

  The Clock must always be in the highest slot in the node because the Control Computer will not activate any module for service that is placed above the Clock. In a multi-cabinet configuration, therefore, the Clock must be in the highest numbered cabinet.
- *Repeater module* in a BNS-2000 VCS node—with its associated I/O board, receives timing and data signals from the Clock module, regenerates them, and supplies them to the backplane bus for the cabinet in which it resides and to the Repeater on the next lower shelf. It also monitors and reports hardware status of the cabinet.

  Each node cabinet except the one containing the Clock module, which has its own internal repeater, contains a Repeater module, installed in the highest addressable slot in each cabinet. The Repeater is a critical module. If it fails, the node fails.

- *Switch module* in a BNS-2000 VCS node—routes data through the network and retains all call addresses in memory for the duration of a call. The Switch is a critical module; if it fails, in a node configured with a single Switch, the node will also fail.

  In a node configured with a redundant Switch module, if the active Switch fails, the standby Switch will automatically be switched over to active status, and the failed Switch will be put out of service. The administrator can also manually switch the standby Switch to active status; this switchover transfers the formerly active Switch to standby.

  The Switch module must be in the lowest active slot number; slot 1 for a single Switch and slots 1 and 2 for dual Switch modules.

The physical slots in a CCM system not occupied by a the CCM itself—or by the CTRM or the Clock, Repeater, or Switch modules—are available for interface and trunk modules.

The standard configurations for the Control Computer(s) using the CCM system are as follows:

- *single Control Computer*—includes the CCM with on-board hard disk, integrated SCSI functionality, and either a controller I/O board (CTS2) or an optional MRCIO (CTS1) for remote maintenance and redundancy capabilities, plus one tape drive (internal or external); see the following figure.
- *dual Control Computer*—includes redundant Control Computers using dual CCMs with on-board disks, integrated SCSI functionality, one controller I/O board (CTS2), one required MRCIO (CTS1) for remote maintenance and redundancy capabilities, plus one tape drive (internal or external). The dual CCMs can reside on the same shelf or in adjacent shelves.

***ECPU System.*** The modules that comprise an ECPU system differ for BNS-2000 nodes and BNS-2000 VCS nodes:

- For a BNS-2000 node, the ECPU system resides in the Series M1 Control Shelf. The control shelf contains the following modules and their associated I/O boards, all of which must reside in the same physical cabinet: a Control Computer including a CTRM, Disk/Tape Subsystem, and an MRCM when a redundant Control Computer is used.

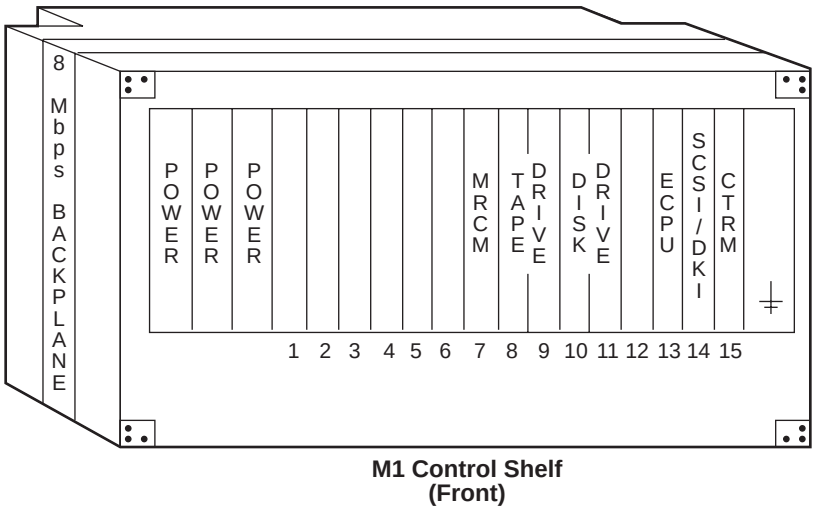



**FIGURE 1-8. BNS-2000 VCS ECPU System Series M1 Control Shelf**

- For a BNS-2000 VCS node, the ECPU system resides in a Series M1 Control Shelf. The control shelf contains the following modules, all of which must reside in the same physical cabinet: a Control Computer including a Switch, a Clock or a Repeater module; Disk/Tape Subsystem; and an MRCM when a redundant Control Computer is used.

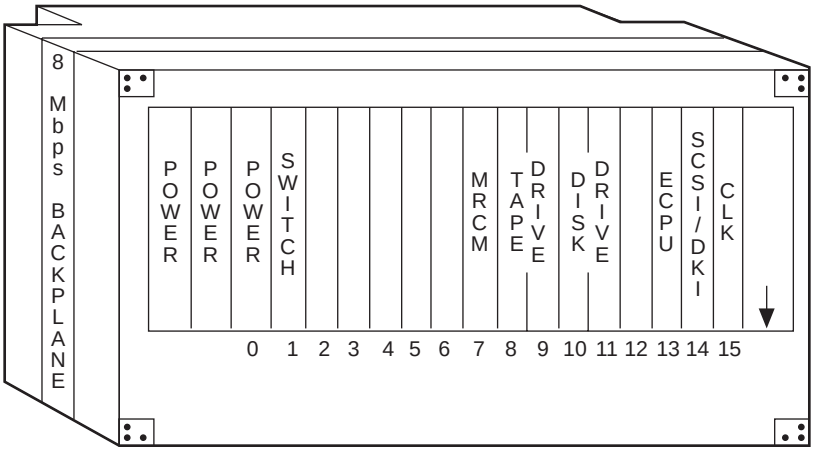



**FIGURE 1-9. BNS-2000 VCS ECPU System Control Cabinet**

In both configurations, the ECPU system consists of the following components:

- *ECPU module*—provides on-board random access memory (RAM), and runs the call control and system management software. It communicates with other Control Computer and interface modules. The administrative interfaces (console and printer) to the node are connected to the ECPU module's AWJ15 I/O board (ports A and B) or the MRCM's AWJ16B I/O board (port M).

  The ECPU module sets up, responds to, and takes down calls, establishing the route that data from a sender will take. It also receives the status poll of interface modules and sends warnings of module failure to the administrative interfaces.

- *SCSI/DKI module*—provides the ECPU module with access to the Control Shelf bus and to the single or dual disks and tapes. The SCSI/DKI module uses an ASP4B I/O board.

- *Switch module*—see the explanation under the CCM System section above.

- *Clock module*—see the explanation under the CCM System section above.

- *Repeater module*—see the explanation under the CCM Configuration section above.

- *Clock/Trunk/Repeater Module (CTRM)*—see the explanation under the CCM System section above.

- *Disk/Tape Drive Subsystem*—consists of tape drives and disk drives:

  — the 40MB *tape drive* is used to install the release software delivered on a 40MB tape onto the fixed disk and to run off-line utility programs and fixed-disk diagnostics. Additional blank, formatted 40MB tapes are used to store the configuration database off-line.

  — the *disk drive* contains all the software required for node operations, including on-line operational software, off-line diagnostic software, and the configuration database that records customer and node parameters. The disk is used for booting the system and saving configuration data.

- *MRCM*—the MRCM is optional with a single Control Computer configuration and required with dual Control Computers to ensure that only one is active at any time. The MRCM can switch to the standby when the active Control Computer fails, and can reboot either Control Computer remotely.

  The MRCM also provides the following: access, communication, and control for two interconnected Control Computers; and an optional multiport interface for activities from a remote console, including access, reboot, reset, administration, and maintenance for single or dual Control Computers.

  This module plugs into the backplane of a Series M1 Control Shelf and makes connections to other modules and to external devices via the AWJ16B I/O board. The AWJ16B supplies RS-232-C ports. Ports A, B, and M provide external I/O ports to which data terminal equipment (DTE) can connect for communication with the MRCM or Control Computer, and ports R and port S provide signals between the MRCM and the Control Computers:

  — *port A* can be connected to the local console (administrative console terminal) or to an asynchronous port on an asynchronous interface module.

  — *port B* can be connected to a printer or set up to provide remote access via the *StarKeeper*® II NMS or the TNM.

  — *port M* (the maintenance port) can connect to any of the Control Computer ports, or it can be used for local console access, for direct administration of the MRCM, and for remote administration of the active or standby Control Computer; port M is connected to a local terminal or a modem. It can also be connected to *StarKeeper* II NMS.

The standard configurations for the Control Computer(s) using an ECPU system are as follows:

- *single Control Computer–single Disk/Tape Subsystem*—includes the ECPU and SCSI/DKI modules and one Disk/Tape Subsystem (disk and tape drive modules); see previous figure.
- *dual Control Computer–dual Disk/Tape Subsystem*—includes redundant Control Computers, dual processors (ECPU and SCSI/DKI modules), dual Disk/Tape Subsystems, and an MRCM. In this configuration, the second Control Shelf is stacked vertically on top of the primary Control Shelf.

### Series M1 Port Shelf

The Series M1 Port Shelf differs from the Series M1 Control Shelf only in the type of modules installed in its slots. In a BNS-2000 node, the Port Shelf contains a CTRM in the highest numbered shelf slot, power supplies, and interface and trunk modules designed for Series M1 Shelves.

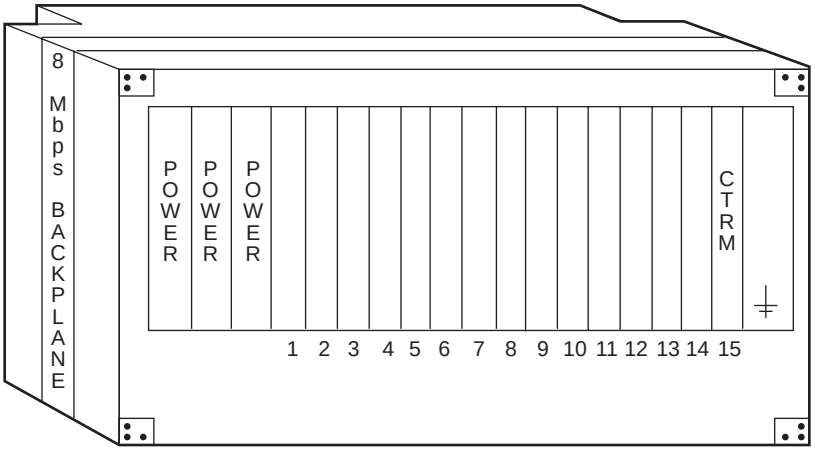



**FIGURE 1-10. BNS-2000 Series M1 Port Shelf**

In a BNS-2000 VCS node, the Port Shelf contains power supplies, interface and trunk modules, and a Repeater module in the highest numbered slot, except for the *last* port cabinet, which contains a Clock module in the highest numbered slot.

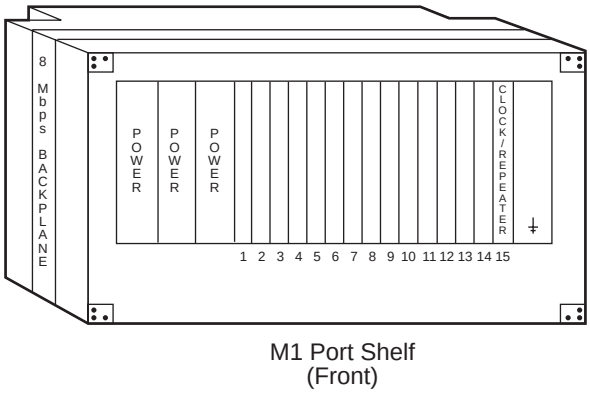



**FIGURE 1-11. BNS-2000 VCS Series M1 Port Shelf**

## Power Distribution

Power distribution is available in these basic configurations:

- *For customer premises (CP) installations*—a Base Power Unit is required for each stack of shelves in a CP node. Line cords distribute 200–240 volts alternating current (VAC) input power from the Base Power Unit to the power entry modules in the shelves.
- *For CO installations*—the –48/–60 volts direct current (VDC) power is distributed via open wiring to the power entry modules within the shelves.

The *Planning Guide* describes power ratings and consumption.

## Power Components

All shelves have a power entry module that connects the input power to the shelf wiring. This wiring distributes the power to the power supplies in each shelf.

### Power Entry Modules

There are four types of power entry modules:

- *ED3P302-30, G4*—for AC-powered Series M2 Shelves
- *ED3P302-30, G5*—for AC-powered Series M1 Shelves
- *ED3P302-30, G6*—for DC-powered Series M2 Shelves
- *ED3P302-30, G7*—for DC-powered Series M1 Shelves

### Power Supplies

There are three types of power supplies, two for AC power input:

- *DCX1836*—for –48/–60 VDC input
- *611C or ACX582*—for 200/240 VAC input

Series M2 Shelves have four power supplies and Series M1 Shelves have three.

### Fuses

Each Series M2 Shelf has 15 fuses, F1 through F15. The fuses are located inside a fuse panel on the front of the shelf, between the power supplies. The fuse in slot F15 is for the backplane terminators. This fuse must be present for the node to operate correctly.

Series M1 Shelves have two fuse modules (ASP2) containing 18 fuses. Of these, 16 are for the slots. An additional fuse (labeled E5) is for the ARU in the CO frame. The remaining fuse (E3) is a spare. An ARU is mounted on the front of the CO frame. The ARU is connected to the Series M1 Control Shelf.

## Interface Modules

Interface modules, with their associated I/O boards, connect end user devices to the node. I/O boards, installed at the rear of shelves and connected to the node backplane, provide RS-232-C, V.35, and other interfaces to customer equipment. Interface modules support asynchronous, synchronous, multiplexed host, LAN interconnect, interworking, and networking communications.

Refer to the *System Description* for details on the interface and trunk modules that are available. Individual module reference documents give specific physical descriptions, as well as installation, cabling, administration, troubleshooting, and command information.

## Administrative Interfaces

Administrative access to the node is determined by a combination of hardware interfaces and by the security arrangements made by the node administrator. Access to the node involves connections for the administrative console (terminal or workstation), a printer, and *StarKeeper* II NMS.

For a CCM system, connections for the console, whether direct or remote, are made via the CCM's CTS1 (MRCIO) I/O board or via the CTS2 I/O board. These I/O boards have cables with two RS-232-C ports (A and B) that can be directly connected to a console or printer, or both.

In a node using the MRCIO, the options for a console connected to port M of the cable are the same as if the console were directly connected to port A of the CTS2 I/O board cable.

For an ECPU system connections to the console are made via the ECPU module AWJ15 I/O board or via the MRCM AWJ16B I/O board. The AWJ15 I/O board has two RS-232-C ports (A and B) that can be directly connected to a console or printer, or both.

In a node using an MRCM, the options for a console connected to the MRCM port M are the same as if the console were directly connected through port A to the AWJ15 board.

The following figure shows an administrative configuration.

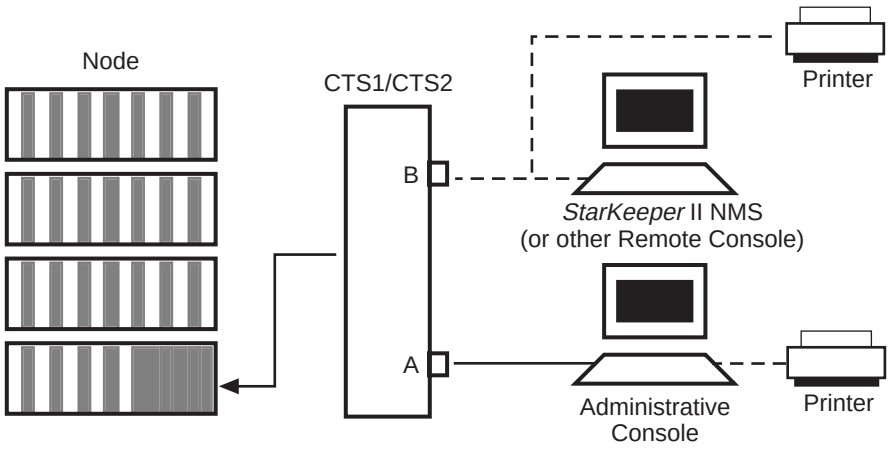



**FIGURE 1-12. Administrative Configuration Example**

Ports A and B can be configured for different arrangements; for example, port A can be configured for a console with a pass-through connection to a printer.

The following table lists the typical port connections for administrative interfaces.

**TABLE 1-1. Administrative Interfaces: Ports A and B**

| Port A | Port B |
|---|---|
| Console with Printer | *StarKeeper* II NMS |
| Console | Printer |
| TNM | Console with Printer |
| Any of the above | Nothing |

### *StarKeeper* II NMS Connections

*StarKeeper* II NMS provides centralized network management for the node. The system provides low-level management functions such as node monitoring and data collection, as well as a high-level graphical view of the network and tools for node and network analysis.

*StarKeeper* II NMS can be connected directly or remotely to the node. The NMS allows the administrator to issue commands from one remote console to each of the monitored nodes. *StarKeeper* II NMS documentation describes the required hardware, software, and connections.

### Remote Console and Printer Connections

An asynchronous terminal or a *StarKeeper* II NMS console, which is usually connected to port B of the Control Computer (CC) via the network, can be used as a remote administrative interface. A remote connection requires two asynchronous ports. Printers connected to a remote console or to other asynchronous interface modules can receive system output.

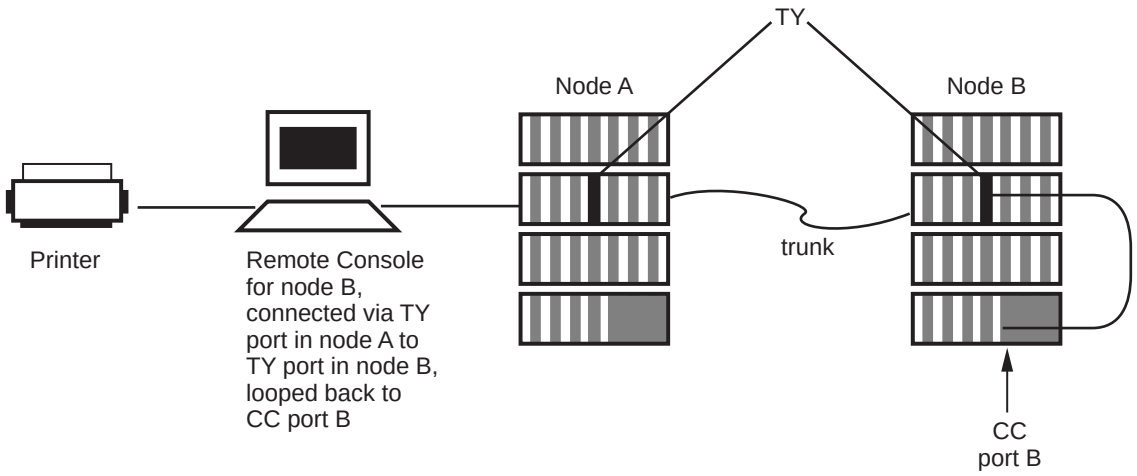



**FIGURE 1-13. Remote Console and Printer Interfaces**

## Shelf Identification

The function of each shelf (control, redundant control, port, extension, or switch) is identified on the outside of the cabinet; a place is also available for the node name. Slot numbers are also shown. Slot numbers are important because modules derive their identifying addresses from the slots they occupy. Slot numbers change depending on how many Extension or Port Shelves are used. In Control and Port Shelves, the front and rear of each shelf have circuit pack labels.

The *Planning Guide* describes the numbering of the physical slots and corresponding logical slot numbers with tables for reference.

### Series M2 Shelves and Slot Identification

Each Series M2 Switch or Extension Shelf has 14 physical slots, numbered 1 through 14. A Series M2 Switch Shelf is always designated as shelf 0, the lowest shelf. The slots are numbered consecutively, bottom to top, from 0/A, 0/B, and 1 through 12.

As the following table shows, Series M2 Extension Shelves may be designated as shelf 1, 2, 3, 6, or 7. The physical slots *2* to *14* are logically numbered beginning with *16* through *28* for Shelf 1. Physical slots are numbered accordingly for the remaining shelves configured.

**TABLE 1-2. BNS-2000 Series M2 Shelf and Slot Numbers**

| Shelf | Shelf Type | Physical Slot | Logical Slot |
|---|---|---|---|
| 0 | Switch Shelf | 1-14 | 0-12 |
| 1 | Extension Shelf | 2-14 | 16-28 |
| 2 | Extension Shelf | 2-14 | 32-44 |
| 3 | Extension Shelf | 2-14 | 48-60 |
| 6 | Extension Shelf | 2-14 | 96-108 |
| 7 | Extension Shelf | 2-14 | 112-124 |
| Slots 29 through 31, 45 through 47, and 61 through 63, and 109 through 111 are not available when shelves 1, 2, 3, 6, and 7 are Extension Shelves. | | | |

The very bottom slot is not available for modules in an Extension Shelf because the rear of the slot must contain either a CNA2 or CNA8 I/O board.

Logical slot numbers are used for identification in the software, and appear on the labels applied during installation to both the front and rear of a shelf; see the **Node Installation** chapter.

Regardless of the type of switch complex used in the configuration, the switch module used in the particular configuration is located in physical slot 1 (logical slot 0/A). The redundant switch module is located in physical slot 2 (logical slot 0/B).

The Series M2 Switch Shelf must contain a CIM for each Series M1 Shelf that will be used in the node. The logical slot number of the CIM determines the logical shelf number (and slot numbering) for administering Series M1 Shelves. For example, a Series M1 Shelf connected to the I/O board (CMC2) for the CIM in logical slot 4 (physical slot 6) is designated as shelf 4.

Series M2 Extension Shelves are connected to the Series M2 Switch Shelf via the ports on the CNA1 or CNA7 I/O board. Intershelf cabling connects the CNA1 or CNA7 to the CNA2 or CNA8 in physical slot 1 of the Series M1 Extension Shelf.

Slots not occupied by modules listed in the following table can be used for Series M2 interface and trunk modules.

**TABLE 1-3. BNS-2000 Series M2 Shelf and Slot Module Assignments**

| Series M2 Switch Shelf | | | |
|---|---|---|---|
| **Physical Slot** | **Module Name** | **Module Code** | **I/O Board** |
| Power | power supply | 611C or ACX582 (AC)<br>DCX1836 (DC) | —<br>— |
| Power | power supply | 611C or ACX582 (AC)<br>DCX1836 (DC) | —<br>— |
| Power | power supply | 611C or ACX582 (AC)<br>DCX1836 (DC) | —<br>— |
| Power | power supply | 611C or ACX582 (AC)<br>DCX1836 (DC) | —<br>— |
| 1* | Standard Switch<br>Extended Switch | CMA1<br>CTG13 | CNA1<br>CNA7** |
| 2* | Redundant Standard Switch<br>Redundant Extended Switch | CMA1<br>CTG13 | CMC3<br>CNA7** |
| 3–9 | CIM | CMA2 | CMC2 |
| 3–14 | interface/trunk | | |
| **Series M2 Extension Shelf** | | | |
| **Physical Slot** | **Module Name** | **Module Code** | **I/O Board** |
| Power | power supply | 611C or ACX582 (AC)<br>DCX1836 (DC) | —<br>— |
| Power | power supply | 611C or ACX582 (AC)<br>DCX1836 (DC) | —<br>— |
| Power | power supply | 611C or ACX582 (AC)<br>DCX1836 (DC) | —<br>— |
| Power | power supply | 611C or ACX582 (AC)<br>DCX1836 (DC) | —<br>— |
| 1 | Standard Switch Configuration; no module in front of slot<br>Extended Switch Configuration; no module in front of slot | —<br>— | CNA2<br>CNA8 |
| 2–14 | interface/trunk*** | | |

* Both switches must be of the same type.

** Double board module.

*** GAR and all Series M2 trunk modules cannot reside in Series M2 Shelves numbered 6 and 7.

### Series M1 Shelf and Slot Identification

Each Series M1 Control or Port Shelf has 16 physical slots, numbered 0 through 15.

The 16 physical slots are logically numbered, from left to right in each shelf and from bottom to top in each stack, *16* through *127* in a BNS-2000 node and *1* through *127* in a BNS-2000 VCS node; these logical slot numbers are used in the software.

The logical slot numbers are found on the rear shelf slot label: 0 through 15. These slots are labeled on both front and rear during installation; see the **Node Installation** chapter.

**TABLE 1-4. Series M1 Shelf and Slot Numbers**

| Shelf | Physical Slot | Logical Slot |
|---|---|---|
| 0* | 0-15 | 0-15 |
| 1 | 0-15 | 16-31 |
| 2 | 0-15 | 32-47 |
| 3 | 0-15 | 48-63 |
| 4 | 0-15 | 64-79 |
| 5 | 0-15 | 80-95 |
| 6 | 0-15 | 96-111 |
| 7 | 0-15 | 112-127 |

* BNS-2000 VCS node only. Slot 0 in Shelf 0 cannot be used. The Switch must reside in logical slot 1.

In a BNS-2000 node, Series M1 Shelves must contain a CTRM in the highest slot (physical slot 15) of the shelf. The CTRM's ASP7B I/O board is connected to a CIM in the Series M2 Switch Shelf.

In a BNS-2000 VCS node, Series M1 Shelves must contain a Clock/Repeater module in the highest slot (physical slot 15) of the shelf. The Clock module is always located in the highest shelf in the node.

Any slots not occupied by power supplies or by the modules that comprise the Control Computer Module System, can be used for interface or trunk modules in either node.

### TABLE 1-5. BNS-2000 Series M1 Shelf Slot Assignments

| Series M1 Control Shelf | | |
|---|---|---|
| **Physical Slot** | **ECPU System Module Name & Code** | **CCM System Module Name & Code** |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| 1–6 | interfaces | interfaces |
| 7 | MRCM: TN2109C | interfaces |
| 8–9 | tape drive: TN2097 | interfaces |
| 10– 11 | disk drive: TN2175B | interfaces |
| 11–12 | 12 is not used | Tape Drive*: TN2233 |
| 13 | ECPU: MC1D138A1 | Tape Drive*: TN2233 or CCM**: TN2235 |
| 14 | SCSI/DKI: UN635B | CCM**: TN2235 |
| 15 | CTRM: TN2096 | CTRM: TN2096 |
| **Series M1 Port Shelf** | | |
| **Physical Slot** | **ECPU System Module Name & Code** | **CCM System Module Name & Code** |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX682)/ DC (DCX1836) |
| 1–14 | interfaces | interfaces |
| 15 | CTRM: TN2096 | CTRM: TN2096 |

* The tape drive can be placed in any two slots as long as the cable reaches the controller; or it can be external, freeing slots for interfaces. Any vacant slot can contain an interface.

** If one CCM resides in slot 14, a second CCM for a dual CC system can be placed in slot 13 in the control cabinet or in physical slots 13 or 14 in the next higher cabinet.

### TABLE 1-6. BNS-2000 VCS Series M1 Slot Assignments

| Control Cabinet | | |
|---|---|---|
| **Physical Slot** | **ECPU System Module Name & Code** | **CCM System Module Name & Code** |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| 0 | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| 1 | Eswitch (cabinet 0)/interface (higher cabinet) | Eswitch (cabinet 0)/interface (higher cabinet) |
| 2 | Optional Eswitch (cabinet 0)/interface | Optional Eswitch (cabinet 0)/interface |
| 3–6 | interfaces | interfaces |
| 7 | MRCM: TN2109C | interfaces |
| 8–9 | tape drive: TN2097 | interfaces |
| 10– 11 | disk drive: TN2175B | interfaces |
| 11–12 | 12 is not used | Tape Drive*: TN2233 |
| 13 | ECPU: MC1D138A1 | Tape Drive*: TN2233 or CCM**: TN2235 |
| 14 | SCSI/DKI: UN635B | CCM**: TN2235 |
| 15 | Clock (CLK): TN1001B or Repeater (RPTR): TN1003 | Clock (CLK): TN1001B or Repeater (RPTR): TN1003 |
| **Port Cabinet** | | |
| **Physical Slot** | **ECPU System Module Name & Code** | **CCM System Module Name & Code** |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| Power | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX582)/ DC (DCX1836) |
| 0 | power supply: AC (611C or ACX582)/ DC (DCX1836) | power supply: AC (611C or ACX682)/ DC (DCX1836) |
| 1–14 | interfaces | interfaces |
| 15 | Clock (CLK): TN1001B or Repeater (RPTR): TN1003 | Clock (CLK): TN1001B or Repeater (RPTR): TN1003 |

* The tape drive can be placed in any two slots as long as the cable reaches the controller; or it can be external, freeing slots for interfaces. Any vacant slot can contain an interface.

** If one CCM resides in slot 14, a second CCM for a dual CC system can be placed in slot 13 in the control cabinet or in physical slots 13 or 14 in the next higher cabinet.

## Cables and Cabling Equipment

Cables and adapters are used to connect interface and trunk modules to a network. Some cables are shielded to minimize electromagnetic interference (EMI). Many cable types are available in versions with or without EMI shielding. Wire cables are available for the following interface types: RS-232-C, RS-449, RS-422, and V.35.

Cabling equipment includes fiber optic modems and multiplexers for asynchronous and synchronous operations; see the *System Description* and the *Cabling Guide*.

## Software Media

Node software is delivered on a release tape.

For a CCM system, one tape contains two sets of release files: one set of files can be loaded directly onto the node (via either an internal or external tape drive) and one set of files can be loaded onto *StarKeeper* II NMS and subsequently downloaded to the node. The type of DDS tape used by the node is identical to that used for *StarKeeper* II NMS.

For the ECPU system, two sets of release software are available: one is supplied on a 40MB tape and can be loaded from the node tape drive. The other is supplied on a DDS tape and can be loaded onto *StarKeeper* II NMS and subsequently downloaded to one or more nodes.

### Node Registration Key

To activate the release software and make the node fully operational, a software registration key is required. This key also makes the software that supports specific features operational.

### Feature Packaging

With a BNS-2000 node, feature packaging allows customers to select and purchase, via the software right-to-use (RTU) fee, modular software packages that support services appropriate for specific environments. Services are grouped into software feature packages that provide selectivity ranging from basic BNS-2000 node support to full data services and special capabilities.

- ***Basic Feature Package*** offers standard support for the BNS-2000 node and basic asynchronous and synchronous interfaces, multiplexed host interfaces, X.25 and X.75 interfaces, special purpose interfaces, the integrated applications processor, internodal trunks (except ATM), and concentrators.
- ***Optional Feature Packages*** can be added to the Basic Feature Package through supplementary packages, as follows for a BNS-2000 node:
  - Frame Relay Feature Package
  - SMDS Feature Package
  - ATM Feature Package

- ***Full Feature Package*** includes support for all features and services on a BNS-2000 node. It is equivalent to the Basic Feature Package and all optional packages listed above.

See the *System Description* for more details on the contents of each feature package for a BNS-2000 node.

For a BNS-2000 VCS node, only the Full Feature Package is provided. It includes support for all features and services; see the *System Description* for more details.

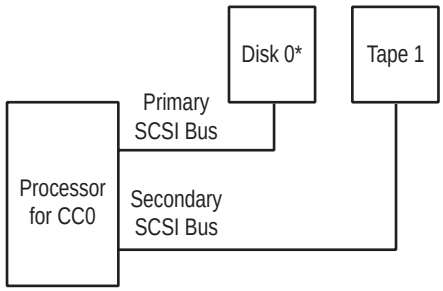
## Disk Resources and Node Configuration

Once the system software is installed on the disk, the active Control Computer runs the operating system. If the system includes a standby Control Computer, the standby executes a partial boot and remains in a standby state. The disks containing the operating system are organized into partitions, or storage areas, with specific functions.

### Single Control Computer Configuration

The Control Computer (CC0) consists of a processor, a disk (disk 0) and a tape. The processor gains access to the disk via the SCSI bus.

The following figures show the connection of the processor to its disk and tape devices in a single Control Computer configuration.




* Disk is on the CCM.

**FIGURE 1-14. Single Control Computer Configuration Example for a CCM System**

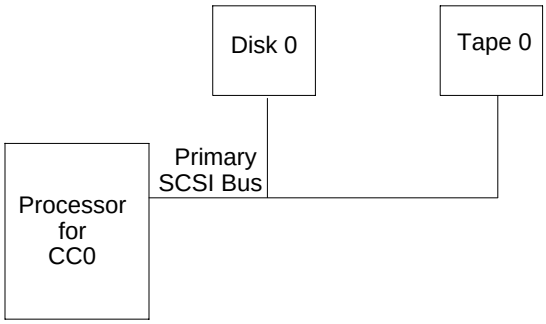



**FIGURE 1-15. Single Control Computer Configuration Example for an ECPU System**

CC0 uses the following disk resources:

- *active file system*—partition 0 contains the release software and configuration data used by the Control Computer. The Control Computer boots from the active file system.
- *staging file system*—partition 1 is used for loading a new software release and for backing out of the active release to an old release; this partition can contain another full release.
- *auxiliary file system*—partition 2 contains scheduled measurements data readable by *StarKeeper* II NMS.
- *backup area*—node configuration database files are copied to this partition using the **retrieve** command, which copies database files from the tape, save area, or host into this partition of the active disk. The **backup active** command copies data from the active file system to this area. When the system is booted, if there is configuration data in the backup partition of the active disk, the Control Computer loads the backup data into the active file system and uses it to configure the node. The backup area is then empty.
- *save area*—node configuration database files are copied from the active file system to this partition using the **backup save** command. The system never automatically writes to or reads from the save area.

The following figure shows how the processor interacts with the active disk in this configuration.

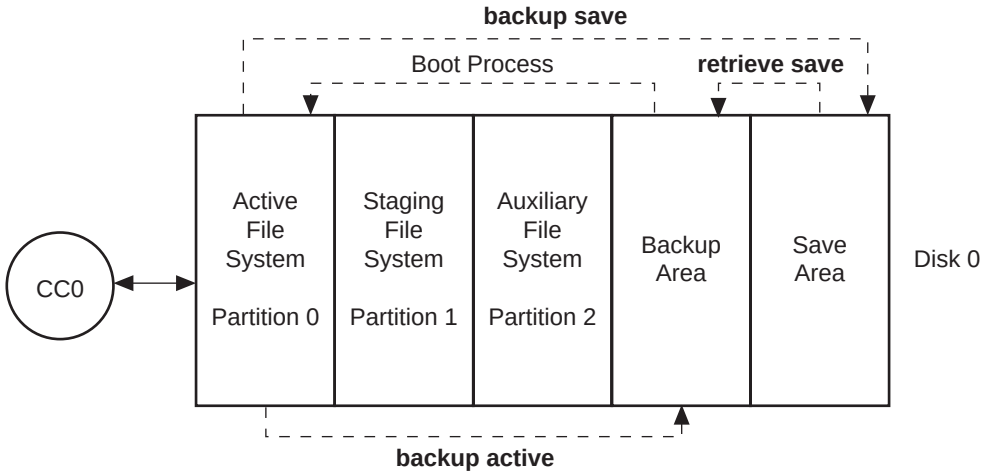



**FIGURE 1-16. Disk Layout Example for a Single Control Computer Configuration**

### Dual Control Computer Configuration

The following figure shows the connection of the processors to disk and tape devices in the dual Control Computer configuration. The interconnected Control Computers are called CC0 and CC1.

For the CCM system, two processors—each with an on-board disk—are used. In addition, one tape device is required, either internal or external. The Control Computer on the control shelf (CC0) is connected via its primary SCSI bus to the redundant Control Computer (CC1) secondary SCSI bus and vice versa. The tape attaches to CC0's secondary SCSI bus.

For the ECPU system, two processors and two Disk/Tape Subsystems are used. The Control Computer on the control shelf (CC0) is connected via its primary SCSI bus to disk 0 and tape 0 and via its secondary SCSI bus to disk 1 and tape 1. The Control Computer on the redundant control shelf (CC1) is connected via its primary SCSI bus to disk 1 and tape 1 and via its secondary SCSI bus to disk 0 and tape 0.

Using dual Control Computers requires remote maintenance and redundancy control functionality to ensure that one Control Computer (either CC0 or CC1) functions as *active* and the other as *standby*.

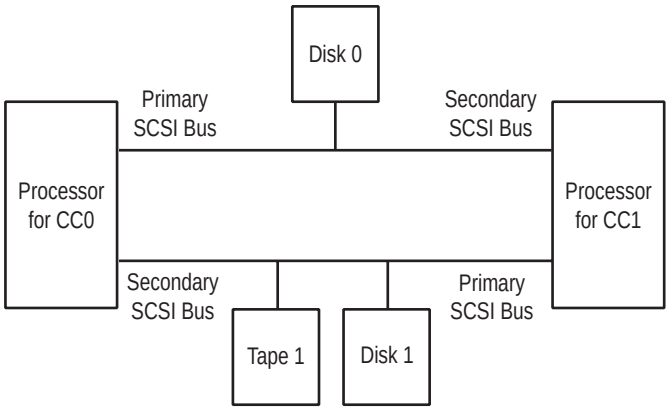
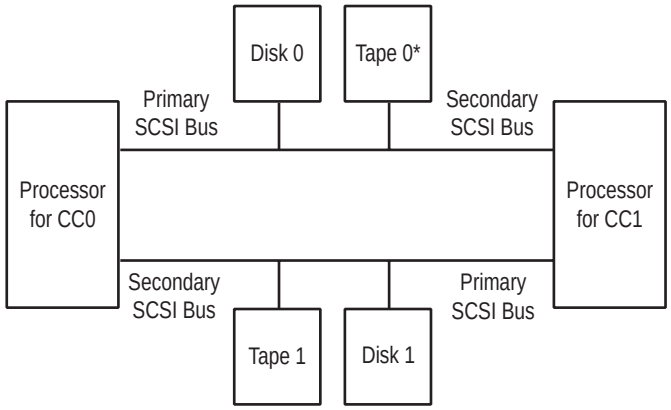



**FIGURE 1-17. Dual Control Computer Configuration Example for a CCM System**




* Tape 0 is not used in a CCM configuration.

**FIGURE 1-18. Dual Control Computer Configuration Example for an ECPU System**

**NOTE:** In a CCM system, the disks are physically part of the processors; the disks reside on the CCM and there is only one tape device (tape 1).

The Control Computers in the CCM and ECPU systems use the following disk resources:

- *active file system*—partition 0 contains the release software and configuration data used by the active processor. The active Control Computer boots from the active file system on its primary disk; that is, if CC0 is active, it boots from the active file system on disk 0. If the primary disk fails, the active Control Computer will use the active file system on its secondary disk, disk 1 for CC0. If CC1 is active, it boots from disk 1; if disk 1 fails, it boots from disk 0. The CCM MRCIO or ECPU MRCM ensures that only one Control Computer is active at a time.
- *staging file system*—partition 1 is used for loading a new software release and for backing out of the active release to an old release; this partition can contain another full release.
- *auxiliary file system*—partition 2 contains scheduled measurements data readable by *StarKeeper* II NMS
- *standby file system*—partition 3 contains a full file system, a copy of partition 0. If CC1 is standby, it boots from the standby file system on disk 1. If the primary disk fails, the standby Control Computer will use the standby file system on its secondary disk, disk 0.
- *backup area*—node configuration database files are copied to this partition using the **retrieve** command, which copies database files from the tape, save area, or host into this partition of the active disk. The **backup active** command copies data from the active file system to this area. When the system is booted, if there is configuration data in the backup partition of the active disk, the Control Computer loads the backup data into the active file system and uses it to configure the node. The backup area is then empty.

  When automatic backup is enabled, the active Control Computer periodically copies the current configuration data to the backup area on the *secondary disk*. For example, when CC0 is active and booted on disk 0, it copies configuration changes to the backup area on disk 1. If automatic backup is not enabled, the **backup standby** command can be used to perform the same operation manually.
- *save area*—an off-line copy of disk configuration data can be stored in this partition. A separate save area exists on disk 0 and on disk 1. The node administrator can specify either area as the target or source of **backup** and **retrieve** commands. One backup command copies configuration data from the active file system to the specified save area. A corresponding retrieve command copies configuration data from the specified save area to the backup area partition on the disk currently used by the active Control Computer. The system never automatically writes to or reads from the save area.

The following figure shows how the processor interacts with disk areas in this configuration.

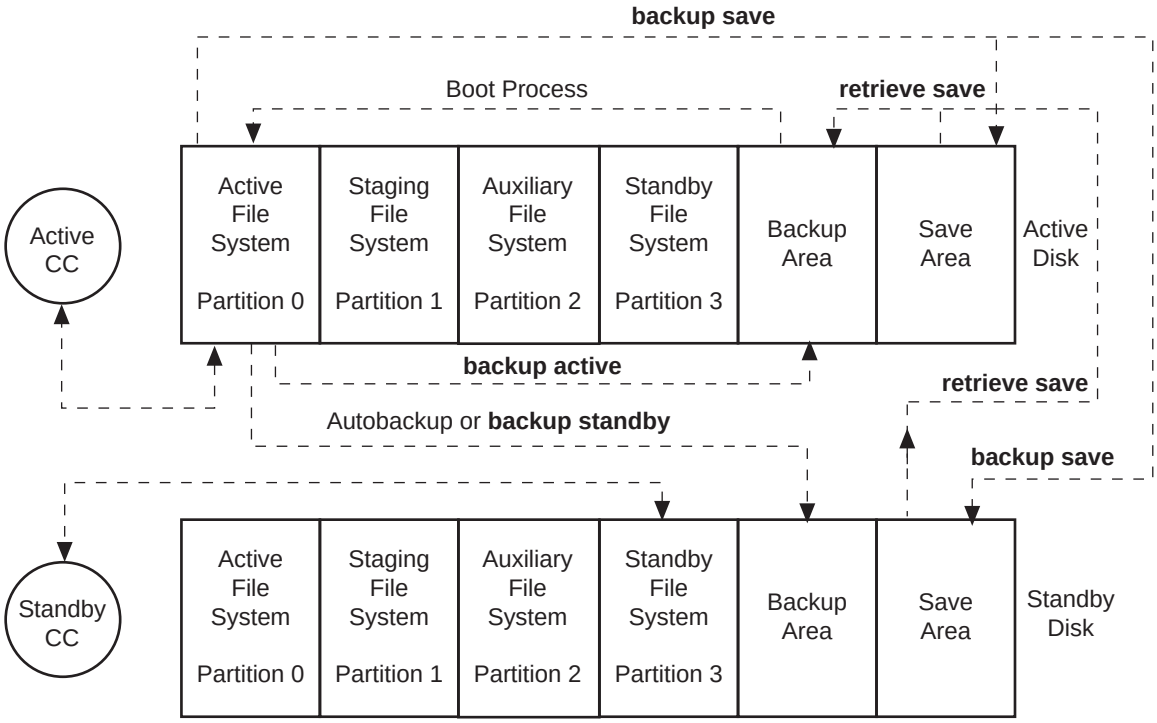



**FIGURE 1-19. Disk Layout Example for a Dual Control Computer Configuration**

# Node Features

The *System Description* explains the relation of node features to the data services provided by the node: basic and switched asynchronous services, predefined destination (PDD) connections, multiplexed host interfaces, X.25/X.75 services, frame relay services, LAN interconnections, interworking, and networking.

For BNS-2000 nodes, the *SMDS Guide* describes how to install, configure, and operate the interfaces for nodes using SMDS. For SMDS, the *Access Interface Module Reference* is also needed.

For BNS-2000 and BNS-2000 VCS nodes, the *Session Maintenance Guide* describes automatic alternate routing and provides instructions on how to configure the node for this feature.

The node features are listed briefly, below, under three broad categories: main features, operational features, and security features.

## Main Features

The node supports a variety of features that allow high-speed data communications between compatible devices supported by interface modules. Besides providing data transport services, the node has administration, configuration, management, diagnostics, maintenance, troubleshooting, and upgrade capabilities. The main features of BNS-2000 and BNS-2000 VCS nodes include:

- *asynchronous service*—provides switched and nonswitched connections between terminals, printers, modems, personal computers (PCs), host computer ports, and other devices using EIA RS-232-C or V.35 interfaces. The node sets up an asynchronous call, either on demand or as a PDD, with other devices connected through multiplexed host interfaces and through other networking services at speeds from 75 bps to 115.2 Kbps.
- *synchronous transport service*—allows both switched communications (for Bisync only) and nonswitched communication, through PDDs, of compatible synchronous devices (for example, hosts, front-end processors (FEPs), and terminal cluster controllers) using an EIA RS-232-C or V.35 interface.
- *X.25 service*—provides two-way communication across an integrated X.25 packet assembler/disassembler (PAD) that conforms with CCITT (ITU-T) Recommendations X.3, X.28, and X.29 using X.121 and E.164 addressing and closed user group (CUG) security. Asynchronous and X.25 devices have switched and PDD access to multiple X.25 hosts on the node's network, X.25 public data networks (PDNs), and endpoints on 5ESS® ISDNs.
- *X.75 gateway service*—provides national and international gateways that support intra-network asynchronous calls as well as network-to-network Full Packet Layer Protocol (FPLP) calls. X.75 service supports X.121/E.164/E.163 international addressing.
- *Frame relay service*—provides LAN interconnect among high-speed frame relay endpoints through wide area networks (WANs). The service supports pre-administered PVCs for connection, congestion detection, Committed Information Rate (CIR), and multicast DLCIs.
- *virtual circuit service*—including asynchronous switched virtual circuits (SVCs) for terminal-to-terminal, terminal-to-host, and host-to-host communications; synchronous and asynchronous automatic connections; and frame relay permanent virtual circuits (PVCs).
- *LAN interconnect service*—via a high-speed frame relay interface.
- *protocol support*—for frame relay, synchronous, multiplexed host, and switched asynchronous communications.
- *internodal communications*—via wire or fiber trunk modules.
- *full, centralized node and network management*—via the *StarKeeper* II NMS.
- *high availability*—with optional automatic switchover to a standby Control Computer or standby Switch module, optional automatic call rerouting around a failed trunk, and automatic alternate routing of a call to the requested destination if needed.

- *host interface support*—for asynchronous hosts via RS-232-C and multiplexed host interfaces for AT&T and a range of other vendors' host computers.
- *interworking*—with other *Datakit*® II VCS, BNS-1000, and BNS-2000 nodes.
- *data transport and backbone connectivity*—with AT&T DEFINITY® 75/85 Communications Systems, 5ESS Switches, and ISNs, connected through a *Datakit* II VCS node to a BNS-2000 node.
- *networking*—support for central office local area networks (CO-LANs) and private customer WANs, including domestic and international networks.

Those distinguishing features of only BNS-2000 nodes are the following:

- *ATM-based high-speed, wide area data communications*—for a network of 200 Mbps switching nodes.
- *DS3 connection-oriented traffic support*—via a trunk module (with or without automatic alternate rerouting).
- *SMDS*—supports access and trunk interfaces for CLNS traffic and an interexchange carrier interface (ICI) among networks for SMDS network traffic that crosses the boundaries of a LATA. This allows interexchange carriers (ICs) and LECs to offer
  - *Exchange Access SMDS*—from a LEC to an IC on an originating or terminating basis
  - *Interexchange SMDS*— from an IC for subscribers across LATA boundaries
  - *Intercompany Serving Arrangements*—for interoperations among LECs within a LATA
  - *Private InterLATA Traffic*—for segregating traffic within a LEC's own network (including that from internal CONS endpoints, CLNS endpoints, and a customer network management server) that crosses LATAs boundaries from public traffic.
- *SMDS Group Address Agent (GAA) capability*—the GAR module enables a BNS-2000 SMDS network to act as a GAA. The agent maintains a group address for a collection of SMDS subscribers. When a network receives data addressed to the group, the agent distinguishes which members in the group should receive the data and it is then sent to the correct end destination; see the *SMDS Guide* for a more detailed explanation of this feature.

## Operational Features

In addition to configuration and management capabilities supported by operational and other sets of commands, automatic resizing of the database, according to service needs, is available. The node operational features include the following configurable options, listed alphabetically:

- *autobaud detection*—for devices supported through basic asynchronous services, allows a device to configure a port (for example, a dial-in modem) at connection time for baud rate. The module connected to the device detects the baud rate of the communicating device, or an end user can signal a terminal's baud rate to the node.

- *configurable options for interface modules*—allow the node administrator to adjust database configurations for specific communication functions and services.
- *extended routing*—enables the call setup algorithm for the node to route calls around trunk failures in ring and mesh networks. When administered, this feature prevents a call setup attempt from looping endlessly under failure conditions and limits the number of nodes a call setup request can cross before it is rejected.
- *host autobaud (speed matching)*— allows two external asynchronous endpoints to communicate with each other at the same speed, which is useful for certain file transfers. If this option is set when administering a host group, the destination port will match the speed of the originating port at call setup.
- *predefined destination (PDD)*—if administered, automatically connects a device or group of devices with a specified destination, without a specific call setup request. When an end user turns on a terminal connected to a host via PDD, the host login prompt appears instead of node prompts. PDDs are available for basic asynchronous service, multiplexed host service (receiving or two-way group only), synchronous services, X.25 services, and LAN interconnect services. For permanently activated ports (available for certain synchronous and asynchronous ports), the PDD is activated when the port is restored.
- *software download*—enables distribution of software to a node from a central *StarKeeper* II NMS location without service disruption and with reliable error detection and retransmission. The software download can be a complete new release or a software patch.
- *speed conversion*—enables two external endpoints to communicate with the network at differing speeds. This feature fully supports any asynchronous device that can accept XON/XOFF or other flow control.
- *splice*—allows the addition of security servers and other applications. It enables a node to divert a call request to an intermediate destination, establish a separate virtual circuit from the intermediate to the final destination, and combine the two calls by removing the intermediate destination.

  Splice is supported for multiplexed hosts or asynchronous endpoints on TY modules, with a UNIX® multiplexed host acting as the splice control point.
- *trace*—for BNS-2000 nodes offering CLNS service, enables the administrator to trace the path that a data segment takes through network components, such as SMDS trunk and access modules, and the GAR module.

## Security Features

The following features are available to provide secure access to the node:

- *closed user group (CUG) security*—provides security for terminals, multiplexed hosts, and X.25 hosts through CUGs by restricting access by members of a CUG group to only those destinations that are members of the same group or that have corresponding access

permissions. Basic CUG security, CUG with incoming access, CUG with outgoing access, and CUG with selection for incoming or outgoing communication are available through CUG profiles set up by the network administrator.

The X.75 gateway feature also allows endpoints that are members of CUGs associated with the node to be mapped to CUGs associated with national and international packet switched PDNs.

- *X.25 incoming/outgoing calls barred*—uses X.25 facilities to prevent an endpoint connected to an X.25 port from originating or receiving calls. An administrator can also define a range of SVC logical channels on a two-way X.25 port that can only receive calls or only originate calls.
- *X.75 gateway utilities*—support security mechanisms on national and international gateways. These utilities screen incoming calls based on Country Code (CC), Telephone Country Code (TCC), or Data Network Identification Code (DNIC) at an international gateway; and they disallow new calls over a gateway module and provide congestion control by allowing an X.75 gateway port to reject any new call attempts in incoming or in outgoing directions. Other features include X.75 CUG indication and X.75 CUG with outgoing access.
- *console security*—to limit access to the administrative console ports, both ports A and B on the Control Computer can be configured for a password. An MRC can also be configured for a password for port M.
- *network access password*—this security feature is available for specified groups of end users. When end users turn on a terminal to signal the node that they wish to make a call, they will see the **`PASSWORD:`** prompt as well as a **`DESTINATION:`** prompt from the node, and must enter the password to gain access to the network.
- *originating group security*—restricts access to resources connected to the node through originating group security patterns. The administrator first assigns each endpoint that can originate calls to an originating group, and then assigns a security pattern to destination addresses. A call setup request succeeds or fails based on matching the endpoint's originating (or two-way) group name with the destination pattern.

  The administrator can also assign an endpoint to a select group, which allows an end user to choose an originating group to belong to when setting up a call. By using the select capability, an end user can gain access to more than one set of restricted resources.
- *call screening security*—is available for calls originating from host computers connected to Computer Port Modules (CPMs) or via trunks for networks that need to restrict incoming calls to certain destinations. For example, all calls from a given node may be allowed to go only to a network access control system. This feature restricts access through profiles entered in the database. These profiles contain sets of security patterns specifying the destinations allowed or forbidden for call setup requests from internodal trunks.

The brief explanations of the node's main, operational, and security features given in this chapter are amplified, as needed, throughout the following chapters.

# Node Installation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# Node Installation

This chapter covers the tasks required to install a node in customer premises (CP) environments and in central offices (COs). The general categories for node hardware installation tasks include: assembling the node cabinetry, cabling the node power system, connecting the node to building power, installing and cabling I/O boards critical modules, installing the critical modules and interface modules, connecting the administration console and system printer, and powering up the system. Additional software installation, start-up, and initial administration procedures are covered in other chapters.

Many procedures listed in the checklists included in this chapter can also be used during operations, maintenance, and troubleshooting activities. For example, installing modules and I/O boards is done for an initial installation, when adding new services, and if a circuit pack fails.

## Node Configurations

BNS-2000 and BNS-2000 VCS nodes can be configured with different:

- ***shelves*** — BNS-2000 nodes are configured with Series M1 and Series M2 Shelves. BNS-2000 VCS nodes are configured with Series M1 Shelves only.
- ***control computers*** — Both BNS-2000 and BNS-2000 VCS nodes support two Control Computer configurations—the CCM system and the ECPU system, which have different control complex elements:
  - — For a CCM system, the node is controlled by a single-board Control Computer Module (CCM) that includes a central processor, a SCSI interface, and disk drive. One internal or external tape drive is also required. For BNS-2000 VCS nodes, a Clock module in the highest logical slot provides timing signals for data transfer. A Switch module completes the virtual circuits, and Repeater modules pass data and clock signals from cabinet to cabinet.
  - — For an ECPU system, the node is controlled by a multi-board computer including a central processing unit (ECPU) module, a SCSI/DKI module, and disk and tape drive modules. For BNS-2000 VCS nodes, the Clock, Switch, and Repeater modules function as described above.
- ***switches*** — When zero to three Series M2 Extension Shelves are used in the configuration, BNS-2000 nodes can be configured with the standard switch complex, which uses the CMA1 switch and CNA1/CMC3 I/O boards for timing and Stratum 4 clocking.

When four or five Series M2 Extension Shelves are used in the configuration or when a Stratum 4 clock is required with separately replaceable Reference Input Boards (RIBs), BNS-2000 nodes are configured with the extended switch complex, which uses the CTG13 switch and the CNA7 Extended Cable/Clock and RIB Status I/O Boards for timing and Stratum 4 clocking.

The following table summarizes these configuration choices:

**TABLE 2-1. BNS-2000 and BNS-2000 VCS Hardware Configurations**

| Node Type | Shelves | | Control Computers | | Switches | | |
|---|---|---|---|---|---|---|---|
| | Series M1 | Series M2 | CCM | ECPU | Eswitch (TN2099) | Standard (CMA1) | Extended (CTG13)* |
| BNS-2000 | √ | √ | √ | √ | | √ | √ |
| BNS-2000 VCS | √ | | √ | √ | √ | | |

* The synchronization unit of the Stratum 4 is a physical part of the extended switch.

The following tables show the components of the recommended hardware configurations for a node in CP and CO environments; and the main control complex configurations.

**TABLE 2-2. CP Node Hardware Configurations**

| Configuration | Structural Support | Power Supplies* | Power Distribution | Power Entry Module |
|---|---|---|---|---|
| 1 or 2 stacks<br><br>**BNS-2000:**<br>2–8 shelves<br>**BNS-2000 VCS:**<br>1–8 shelves<br><br>1 Base Power Unit per stack | Base Power Unit anchored to floor; stack bracketed together. | ACX582 (AC) or 611C<br><br>DCX1836 (DC) | Power base distributes power to all shelves in a stack.<br><br>Breakers on top of frame distribute power to power entry module. | ED3P302-30,G4 (AC) for Series M2 Shelves<br>ED3P302-,G5 (AC) for Series M1 Shelves<br><br>ED3P302-30,G6 (DC) for Series M2 Shelves<br>ED3P302-30,G7 (DC) for Series M1 Shelves |
| * Use four per Series M2 Shelf; use three per Series M1 Shelf. | | | | |

**TABLE 2-3. CO Node Hardware Configurations**

| Configuration | Structural Support | Power Supplies* | Power Distribution | Power Entry Module |
|---|---|---|---|---|
| **BNS-2000:**<br>2–8 shelves<br>**BNS-2000 VCS:**<br>1–8 shelves<br><br>No Base Power Unit | 78-inch frame anchored to floor per 4 shelves. | DCX1836 (DC) | Breakers on top of frame distribute power to power entry module. | ED3P302-30,G6 (DC) for Series M2 Shelves<br>ED3P302-30,G7 (DC) for Series M1 Shelves |
| * Use 4 per Series M2 Shelf; use 3 per Series M1 Shelf. | | | | |

### TABLE 2-4. CCM System Control Complex Configurations

| Control Computer Configuration | I/O Board | Switch Module (Single or Dual) | Component Placement |
|---|---|---|---|
| Single CCM–<br>Single Tape Drive<br>(internal or external) | CTS2<br>CSD9 | CTG13<br>CMA1<br>TN2099 | If an internal tape drive is used, it must reside in the same Series M1 Shelf as the CCM.<br>**BNS-2000:** Depending on the number of Series M2 Extension Shelves and the type Stratum 4 clocking required, a single switch must reside in slot A and a redundant switch in slot B of shelf 0 in the Series M2 Switch Shelf.<br>**BNS-2000 VCS:** A single TN2099 must reside in slot 1 and a redundant TN2099 must reside in slot 2 of a Series M1 Control Shelf. |
| Single CCM–<br>Single Tape Drive<br>(internal or external) | MRCIO<br>(CTS1)<br>CSD9 | CTG13<br>CMA1<br>TN2099 | If an internal tape drive is used, it must reside in the same Series M1 shelf as the CCM.<br>**BNS-2000:** Depending on the number of Series M2 Extension Shelves and the type Stratum 4 clocking required, a single switch must reside in slot A and a redundant switch in slot B of shelf 0 in the Series M2 Switch Shelf.<br>**BNS-2000 VCS**: A single TN2099 must reside in slot 1 and a redundant TN2099 must reside in slot 2 of a Series M1 Control Shelf. |
| Dual CCM–<br>Single Tape Drive<br>(internal or external) | MRCIO<br>(CTS1)<br>CTS2<br>CSD9 | CTG13<br>CMA1<br>TN2099 | If an internal tape drive is used, it must reside in the same Series M1 Control Shelf as the CCM. A second, redundant CCM should reside in the next higher Series M1 shelf.<br>**BNS-2000:** Depending on the number of Series M2 Extension Shelves and the type Stratum 4 clocking required, a single switch must reside in slot A and a redundant switch must reside in slot B of shelf 0 in the Series M2 Switch Shelf.<br>**BNS-2000 VCS**: A single TN2099 must reside in slot 1 and a redundant TN2099 must reside in slot 2 of a Series M1 Control Shelf. |

**TABLE 2-5. ECPU System Control Complex Configurations**

| Control Computer Configuration | MRCM | Switch Module | Component Placement |
|---|---|---|---|
| Single Processor–Single Disk/Tape Subsystem | optional | CTG13<br>CMA1<br>TN2099 | The processor (ECPU and SCSI/DKI modules) and Disk/Tape Subsystem (disk and tape drives) must reside in the same Series M1 Shelf. The MRCM, if used, must reside in the same shelf.<br>**BNS-2000:** Depending on the number of Series M2 Extension Shelves and the type Stratum 4 clocking required, a single switch must reside in slot A and a redundant switch must reside in slot B of shelf 0 in the Series M2 Switch Shelf.<br>**BNS-2000 VCS:** A single Switch module must reside in slot 1; a redundant Switch module in slot 2 of shelf 0. |
| Dual Processor–Dual Disk/Tape Subsystem | required | CTG13<br>CMA1<br>TN2099 | The processor (ECPU and SCSI/DKI modules), Disk/Tape Subsystem (disk and tape drives), and MRCM must reside in the same Series M1 shelf. The second processor and Disk/Tape Subsystem must reside in the next (higher numbered) shelf.<br>**BNS-2000:** Depending on the number of Series M2 Extension Shelves and the type Stratum 4 clocking required, a single switch must reside in slot A and a redundant switch in slot B of shelf 0 in the Series M2 Switch Shelf.<br>**BNS-2000 VCS:** A single Switch module must reside in slot 1; a redundant Switch module in slot 2 of shelf 0. |

# Node Hardware Installation Checklists

The checklists that follow will aid you during installation of a BNS-2000 or BNS-2000 VCS CP or CO node.

The procedures and sections in each checklist are listed in the order in which they should be done. The order can be adjusted depending on availability of components or the specific requirements of the site or configuration.

### TABLE 2-6. Hardware Installation Checklist for BNS-2000 CP Node With Base Power Unit

| √ | Section or Procedure |
|---|---|
| | *Node Installation Preparation* |
| | Procedure 2-1. Unpacking Cabinets |
| | Procedure 2-2. Unpacking the Base Power Unit |
| | Procedure 2-3. Anchoring the Base Power Unit to the Floor |
| | Procedure 2-4. Assembling a Node With a Base Power Unit |
| | Procedure 2-5. Connecting the Base Power Unit to Building Power and Ground |
| | Procedure 2-6. Grounding the Branch Circuit |
| | Procedure 2-7. Installing the Power Entry Module |
| | Procedure 2-8. Wiring the Power Entry Module With a Base Power Unit |
| | Procedure 2-13. Inserting and Removing Power Supplies |
| | Procedure 2-14. Applying Labels |
| | *Setting Options on Modules and I/O Boards* |
| | Procedure 2-17. Inserting I/O Boards |
| | Procedure 2-19. Cabling I/O Boards for a Standard Series M2 Shelf Configuration |
| | Procedure 2-20. Cabling I/O Boards for an Extended Series M2 Shelf Configuration |
| | *Cabling Control Computer I/O Boards* |
| | Procedure 2-21. Adding a Series M1 Shelf to an Existing Node with a Standard Switch Configuration |
| | Procedure 2-22. Adding a Series M2 Extension Shelf to an Existing Node with a Standard Switch Configuration |
| | Procedure 2-23. Adding a Series M2 Extension Shelf to an Existing Node with Four or Five Series M2 Extension Shelves |
| | *Installing Boards* |
| | Procedure 2-25. Inserting a Module |
| | Procedure 2-27. Inserting a CCM |
| | Procedure 2-30. Inserting ECPU and SCSI/DKI Control Computer Modules |
| | Procedure 2-32. Inserting the Tape Drive on a CCM System |
| | Procedure 2-34. Inserting Disk and Tape Drives on an ECPU System |

**TABLE 2-6. Hardware Installation Checklist for BNS-2000 CP Node With Base Power Unit** (continued)

| √ | Section or Procedure |
|---|---|
| | *Routing I/O Cables* |
| | Procedure 2-36. Installing Cable Covers and Guides |
| | Procedure 2-37. Connecting the Console |
| | Procedure 2-38. Cabling a Printer or ARU |
| | Procedure 2-39. Connecting a Printer to Port B |
| | Procedure 2-40. Cabling *StarKeeper* II NMS to the Node via Modem |
| | Procedure 2-41. Cabling *StarKeeper* II NMS to the Node via CPM-HS |
| | Procedure 3-1. Powering Up a Node With a Base Power Unit |
| | Procedure 3-2. Powering Up a Node With a Base Power Unit and Battery Backup |

### TABLE 2-7. Hardware Installation Checklist for BNS-2000 Node in a CO Frame

| √ | Section or Procedure |
|---|---|
| | *Node Installation Preparation* |
| | Procedure 2-1. Unpacking Cabinets |
| | Procedure 2-9. Installing Covers and Kickplates on a CO Frame |
| | Procedure 2-10. Installing the CO Frame |
| | Procedure 2-11. Inserting and Removing Shelves in the CO Frame |
| | Procedure 2-12. Making CO Frame Power Connections |
| | Procedure 2-13. Inserting and Removing Power Supplies |
| | Procedure 2-14. Applying Labels |
| | *Setting Options on Modules and I/O Boards* |
| | Procedure 2-17. Inserting I/O Boards |
| | Procedure 2-19. Cabling I/O Boards for a Standard Series M2 Shelf Configuration |
| | Procedure 2-20. Cabling I/O Boards for an Extended Series M2 Shelf Configuration |
| | *Cabling Control Computer I/O Boards* |
| | Procedure 2-21. Adding a Series M1 Shelf to an Existing Node with a Standard Switch Configuration |
| | Procedure 2-22. Adding a Series M2 Extension Shelf to an Existing Node with a Standard Switch Configuration |
| | Procedure 2-23. Adding a Series M2 Extension Shelf to an Existing Node with Four or Five Series M2 Extension Shelves |
| | *Installing Boards* |
| | Procedure 2-25. Inserting a Module |
| | Procedure 2-27. Inserting a CCM |
| | Procedure 2-30. Inserting ECPU and SCSI/DKI Control Computer Modules |
| | Procedure 2-32. Inserting the Tape Drive on a CCM System |
| | Procedure 2-34. Inserting Disk and Tape Drives on an ECPU System |
| | *Routing I/O Cables* |
| | Procedure 2-36. Installing Cable Covers and Guides |
| | Procedure 2-37. Connecting the Console |
| | Procedure 2-38. Cabling a Printer or ARU |
| | Procedure 2-39. Connecting a Printer to Port B |
| | Procedure 2-40. Cabling *StarKeeper* II NMS to the Node via Modem |
| | Procedure 2-41. Cabling *StarKeeper* II NMS to the Node via CPM-HS |
| | Procedure 3-3. Powering Up a CO Frame |

### TABLE 2-8. Hardware Installation Checklist for BNS-2000 VCS CP Node With Base Power Unit

| √ | Section or Procedure |
|---|---|
| | *Node Installation Preparation* |
| | Procedure 2-1. Unpacking Cabinets |
| | Procedure 2-2. Unpacking the Base Power Unit |
| | Procedure 2-3. Anchoring the Base Power Unit to the Floor |
| | Procedure 2-4. Assembling a Node With a Base Power Unit |
| | Procedure 2-5. Connecting the Base Power Unit to Building Power and Ground |
| | Procedure 2-6. Grounding the Branch Circuit |
| | Procedure 2-7. Installing the Power Entry Module |
| | Procedure 2-8. Wiring the Power Entry Module With a Base Power Unit |
| | Procedure 2-13. Inserting and Removing Power Supplies |
| | Procedure 2-14. Applying Labels |
| | *Setting Options on Modules and I/O Boards* |
| | Procedure 2-15. Setting Switches on the ASP1 |
| | Procedure 2-21. Adding a Series M1 Shelf to an Existing Node with a Standard Switch Configuration |
| | Procedure 2-24. Connecting Clock and Bus Cables for BNS-2000 VCS Nodes |
| | *Installing Boards* |
| | Procedure 2-25. Inserting a Module |
| | Procedure 2-27. Inserting a CCM |
| | Procedure 2-30. Inserting ECPU and SCSI/DKI Control Computer Modules |
| | Procedure 2-32. Inserting the Tape Drive on a CCM System |
| | Procedure 2-34. Inserting Disk and Tape Drives on an ECPU System |
| | *Routing I/O Cables* |
| | Procedure 2-36. Installing Cable Covers and Guides |
| | Procedure 2-37. Connecting the Console |
| | Procedure 2-38. Cabling a Printer or ARU |
| | Procedure 2-39. Connecting a Printer to Port B |
| | Procedure 2-40. Cabling *StarKeeper* II NMS to the Node via Modem |
| | Procedure 2-41. Cabling *StarKeeper* II NMS to the Node via CPM-HS |

### TABLE 2-9. Hardware Installation Checklist for BNS-2000 VCS Node in a CO Frame

| √ | Section or Procedure |
|---|---|
| | *Node Installation Preparation* |
| | Procedure 2-1. Unpacking Cabinets |
| | Procedure 2-9. Installing Covers and Kickplates on a CO Frame |
| | Procedure 2-10. Installing the CO Frame |
| | Procedure 2-11. Inserting and Removing Shelves in the CO Frame |
| | Procedure 2-12. Making CO Frame Power Connections |
| | Procedure 2-13. Inserting and Removing Power Supplies |
| | Procedure 2-14. Applying Labels |
| | *Setting Options on Modules and I/O Boards* |
| | Procedure 2-15. Setting Switches on the ASP1 |
| | Procedure 2-17. Inserting I/O Boards |
| | Procedure 2-21. Adding a Series M1 Shelf to an Existing Node with a Standard Switch Configuration |
| | Procedure 2-24. Connecting Clock and Bus Cables for BNS-2000 VCS Nodes |
| | *Installing Boards* |
| | Procedure 2-25. Inserting a Module |
| | Procedure 2-27. Inserting a CCM |
| | Procedure 2-30. Inserting ECPU and SCSI/DKI Control Computer Modules |
| | Procedure 2-32. Inserting the Tape Drive on a CCM System |
| | Procedure 2-34. Inserting Disk and Tape Drives on an ECPU System |
| | *Routing I/O Cables* |
| | Procedure 2-36. Installing Cable Covers and Guides |
| | Procedure 2-37. Connecting the Console |
| | Procedure 2-38. Cabling a Printer or ARU |
| | Procedure 2-39. Connecting a Printer to Port B |
| | Procedure 2-40. Cabling *StarKeeper* II NMS to the Node via Modem |
| | Procedure 2-41. Cabling *StarKeeper* II NMS to the Node via CPM-HS |

# Node Installation Preparation

To prepare the site for node installation, consult the *Planning Guide* for recommendations and requirements.

## Equipment Handling

The **Node Maintenance** chapter includes environmental and equipment handling guidelines, which should be reviewed before performing a hardware installation. To keep the installation site clean, unpack equipment outside the room where it will be installed.

Before accepting delivery of node equipment, check for external physical damage to the package. Shipping damage is normally the responsibility of the carrier.

### ESD

Many installation procedures require handling modules and I/O boards (circuit packs). Circuit packs are easily damaged by electrostatic discharge (ESD). When handling circuit packs, always wear a properly grounded ESD wrist strap.

For Series M2 Shelves, jacks for grounding the wrist strap are located on the lower right front corner and upper right rear corner of the shelf.

For Series M1 Shelves, grounding jacks are located on the divider next to slot 15 in the front of the shelf, and near the power entry module on the right end of the slot area in the back.

### EMI

Ensure protection from electromagnetic interference (EMI); see the inside front cover of this document.

### Moving Equipment

Each cabinet weighs about 100 to 150 pounds empty, and up to about 175 pounds with all slots filled.

An ACD Base Power Unit weighs 105 pounds.

Cabinets and Base Power Units can be moved on a dolly or with a mechanical lift. Mounting stacks of cabinets without the aid of a mechanical lift may require up to four people.

Follow your company's rules for handling heavy equipment.

### Required Tools

The following tools are required for performing node hardware installation procedures.

**TABLE 2-10. Hardware Installation Tools Checklist**

| √ | Tools |
|---|---|
| | 3-inch flat blade screwdriver |
| | 12-inch flat blade screwdriver |
| | 14-inch "quick-wedge" or small screw-starting tool |
| | small Phillips-head screwdriver |
| | large Phillips-head screwdriver |
| | 6- or 8-inch adjustable wrench |
| | 7/16-inch box wrench |
| | 1/4-inch nut driver |
| | 1/8-inch nut driver |
| | 7/16-inch nut drivers |
| | 1/4-inch drive socket set |
| | voltmeter |
| | ESD wrist strap |

When equipment must be secured for earthquake protection, electric drills, drill bits, and anchor hardware are also required.

## Node Assembly

This section covers the standard assembly and installation of node cabinetry, including:

- unpacking node cabinetry
- installing and wiring the Base Power Unit
- stacking and wiring shelves for a CP node
- installing shelves in a CO frame
- connecting to CO power
- installing and wiring shelf power supplies
- labeling shelves

The procedures required depend on the configuration and location of the node being installed. Refer to the preceding hardware installation checklist that is appropriate for the type of node hardware being installed.

## Unpacking Node Cabinetry

Unpack the shelves and the Base Power Unit, using the steps in the following two procedures.

### PROCEDURE 2-1. Unpacking Cabinets

**Application:** Node in CP or CO environment.

Cabinets are shipped as ordered from the factory. They can be moved on a dolly or with a mechanical lift. Mounting stacked cabinets without a mechanical lift might require several people. Follow your company's rules for handling heavy equipment.

1. Remove the straps that secure the shipping case to the pallet.
2. Remove the cabinets/shelves from the shipping case. Remove any other packaging material.

   **CAUTION:** Grasp only the metal housing of a cabinet. The back corners of a cabinet are recessed to serve as cable runs. A plastic cable cover snaps over the recess to hide the cables after installation. If this cable cover is in place, do not grab it when you lift the cabinet, because it will slip loose under the strain.

3. Inspect the housing for damage.
4. Open the front door and rear panel of each cabinet/shelf.
   a. The front door is hinged at the bottom and secured with two quarter-turn fasteners in the top corners. Turn the fasteners counterclockwise to open.
   b. The rear panel hangs on two tabs at the bottom and is secured by captive screws at the top. Turn the screws counterclockwise to open.
5. Inspect the modules and I/O boards for obvious physical damage such as dents or misalignment.
6. Compare the modules and I/O boards in each cabinet to the shipment order.
7. Secure the front door and the rear panel by turning the screws clockwise.

**PROCEDURE 2-1. Unpacking Cabinets** (continued)

8. Verify that the following items were shipped with each cabinet/shelf:

| √ | Items Shipped With Cabinet |
|---|---|
| | Spare fuses |
| | 2 grounding straps for front of cabinet/shelf |
| | 2 L-shaped brackets for cable management areas |
| | Line cords for power connections |
| | Fiber cable for BNS-2000 Series M1 Shelf node |
| | Clock and bus cable for BNS-2000 VCS Series M1 Shelf node |
| | Multiple-coaxial cable for BNS-2000 Series M2 Extension Shelf node |
| | 2 cable covers |
| | MRC cables with ferrite cores, if using the MRCIO |

**PROCEDURE 2-2. Unpacking the Base Power Unit**

**Application:** Node with Base Power Unit in CP environment.

Each Base Power Unit is shipped with all equipment installed. Interconnecting line cords are included. Brackets for bolting the unit to the floor are also included, if they were ordered.

1. Remove the straps that secure the shipping case to the pallet.
2. Remove the Base Power Unit from the shipping case.
3. Remove packaging material such as tie downs and string.
4. Inspect the housing for damage.

## Installing the Base Power Unit

The Base Power Unit distributes power to the node and serves as a base for the stack of shelves. Base Power Units should be bolted to the floor as described in the following procedure. The line cord power connection is field-installed; see the Node Power Connections section of this chapter.

### PROCEDURE 2-3. Anchoring the Base Power Unit to the Floor

**Application:** All CP nodes.

**Requirements:** Allow a minimum of three feet of free space, front and rear, for convenient access to the node.

To make it easier to move the Base Power Unit back and forth, floor brackets are installed before any cabinets are stacked on the base.

Two brackets secure the Base Power Unit cabinet to the floor. The L-type bracket is the rear bracket; the short leg goes on the floor. The U-type bracket is the front bracket; the long leg goes on the floor; see the following figure.

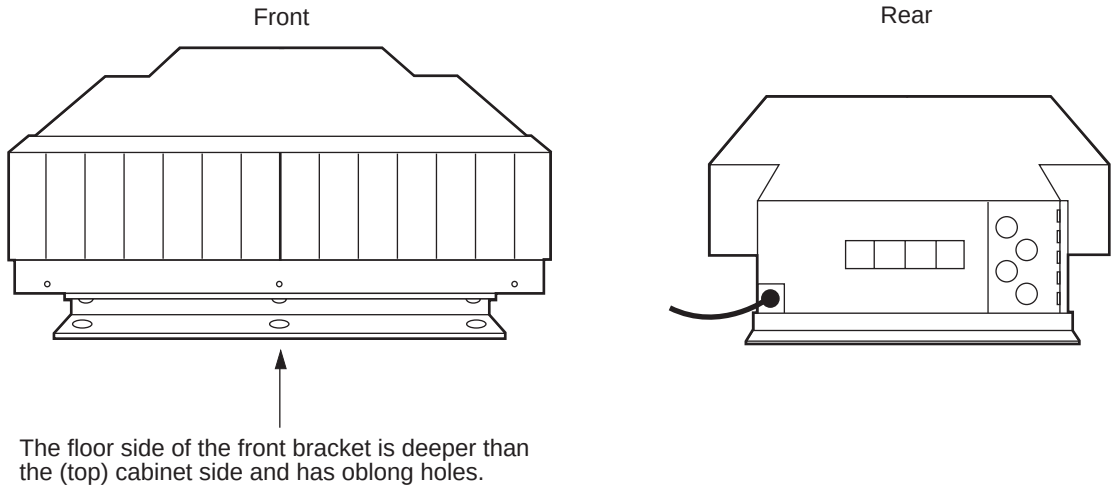



**FIGURE 2-1. Securing the Base Power Unit to Floor**

1. Move the Base Power Unit to its final position.
2. Partially insert the three bolts on the underside of the front of the Base Power Unit. Slide the front U-type bracket in from the side and pull it forward onto the bolts. Mark the floor hole positions and temporarily remove the bracket.

**PROCEDURE 2-3. Anchoring the Base Power Unit to the Floor** (continued)

3. Set the rear L-type bracket in place; mark the floor hole positions and temporarily remove the bracket.
4. Drill holes in the floor. Set anchors or through-bolts, if necessary. Shift the Base Power Unit slightly to get it out of the way, if necessary.
5. Move the Base Power Unit back into its final position and re-install the front U-type bracket loosely as before. Install the floor bolts and tighten both the cabinet and floor bolts on the front bracket.
6. Install the floor and Base Power Unit bolts on the rear L-type bracket.

## Stacking and Wiring Shelves in a CP Node

Shelves are designed to be stacked up to four high on top of a Base Power Unit without any additional support or hardware, except for the brackets connecting the shelves. The following procedure explains how to assemble two to eight shelves and Base Power Units into a node.

**CAUTION:** Support brackets are required; they provide the stack with structural rigidity. If not installed, the company will not be liable for any injury caused by tilting of the shelves.

Although a node can be assembled as a modular stack in any environment, this configuration is *not* used in COs where the node will operate on –48/–60 VDC. Assembly procedures for the CO frame are given later in this chapter.

This section covers the standard AC power connections for the CP node including wiring the Base Power Unit and installing and wiring the power entry module. The following table summarizes valid AC power hardware and service combinations for the node.

**TABLE 2-11. AC Power Service Combinations**

| Connection Method | (50/60 Hz) | Country |
|---|---|---|
| Line cord from power entry module to 200–240 VAC Base Power Unit | 200 | Hong Kong, Japan, South Korea |
| | 208 | USA |
| | 220 | Argentina, France, Italy, Netherlands, Spain, Taiwan, Thailand, Germany |
| | 230 | Singapore |
| | 240 | Australia, Canada, UK, USA, Venezuela |

### PROCEDURE 2-4. Assembling a Node With a Base Power Unit

**Application:** Nodes with Base Power Units.

A node can be assembled as a single or double stack. The number of shelves in a single BNS-2000 node stack can be two, three, or four; the number of shelves in a single BNS-2000 VCS node stack can be one, two, three, or four. For a two-stack node, the first stack usually has four shelves while the second stack can have from one to four shelves.

It may be more convenient to assemble the stack in front of or in back of its final position. It will be easier to reach some of the screws and the stack can be rolled into place on the Base Power Unit casters.

1. Verify that the Base Power Unit is secured to the floor.
2. Set the bottom shelf of the stack (shelf 0) on the base. Align the sides of the shelf with the sides of the base.
3. Install the grounding straps and brackets (included with the Base Power Unit) to fasten the shelf to the Base Power Unit; see the following figure.

   The screws for the brackets are in their holes. Remove them carefully, position the bracket, and replace and tighten the screws.
4. Repeat step 3 for shelves 1, 2, and 3 until the stack is complete.

   **NOTE:** A set of brackets is included with each shelf. One set of shelf brackets is left over for each stack, because the brackets included with the Base Power Unit are used to attach the bottom shelf to the base.
5. For a two-stack node, after the first stack is complete, set the Base Power Unit for the second stack in position at least one inch to the right of the first stack.
6. Secure the Base Power Unit for the second stack to the floor; see the previous procedure.
7. Repeat steps 2, 3, and 4 until the second stack is complete.

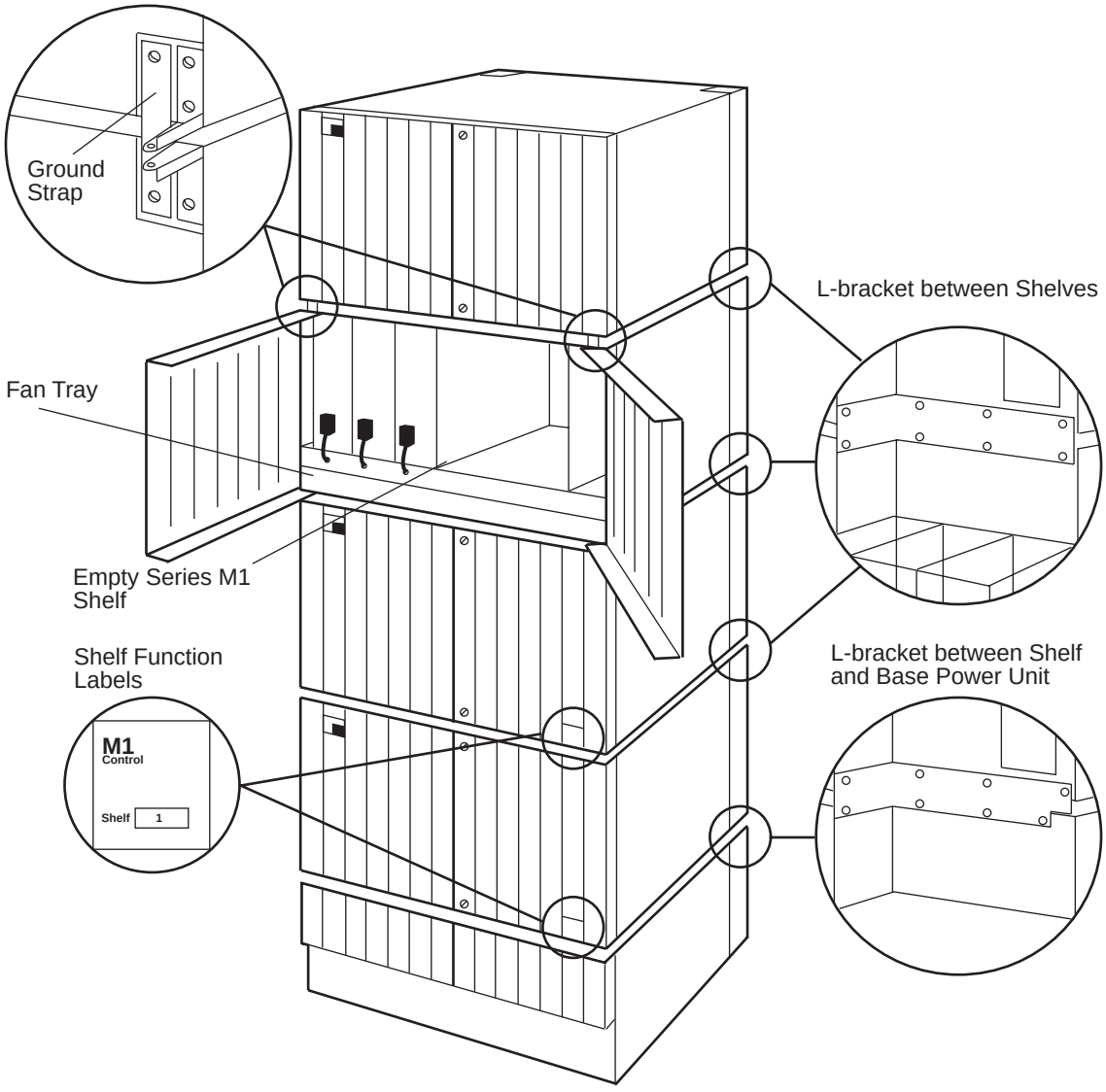



**FIGURE 2-2. Shelves With Base Power Unit: Stacked and Secured**

### PROCEDURE 2-5. Connecting the Base Power Unit to Building Power and Ground

**Application:** Nodes with Base Power Units.

The following line cords are available for USA installations where permitted by code:

- *208 VAC, 30 A rating, National Electrical Manufacturers Association (NEMA) L21-30P*—used with the NEMA receptacle L21-30R
- *240 VAC, 30 A rating, NEMA L14-30P*—used with the NEMA receptacle L14-30R

1. Use the appropriate line cord to connect the Base Power Unit to the 200–240 VAC building power. The opening on the back panel of the Base Power Unit is 1-inch trade size (1.375 inches) to accommodate 8- or 10-gauge SO three-conductor line cord.

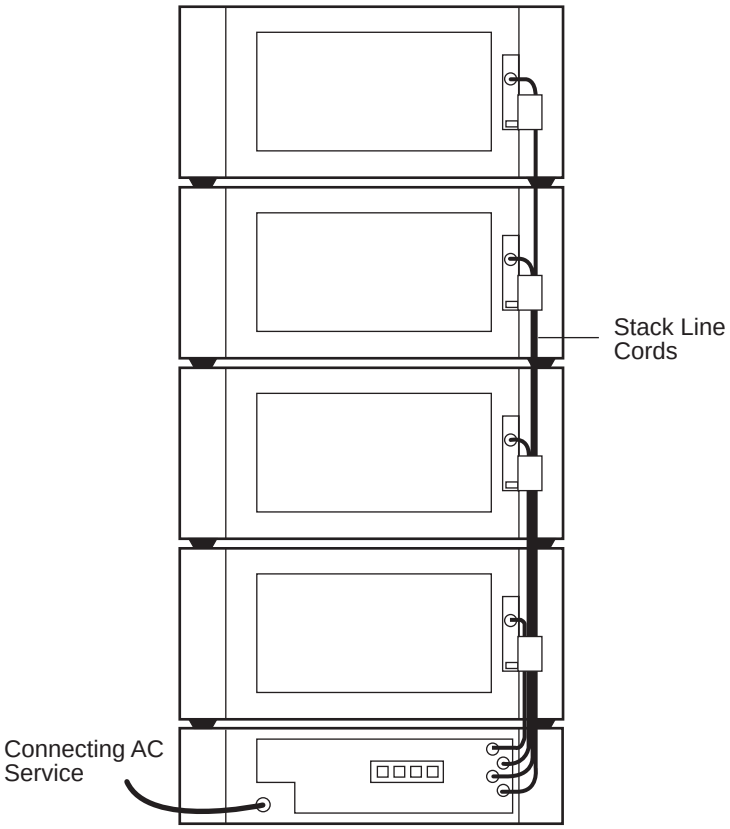



**FIGURE 2-3. Power Wiring for a Stack**

**PROCEDURE 2-5. Connecting the Base Power Unit to Building Power and Ground** (continued)

2. In the rear of the Base Power Unit, 1/4-inch 20-thread grounding terminals provide a single-point ground connection via 6-gauge wire. The ground wire exits the shelf in the cable management area near the hinge on the back door. The following figure shows the terminal block and ground connection (inside the back door, on the left).

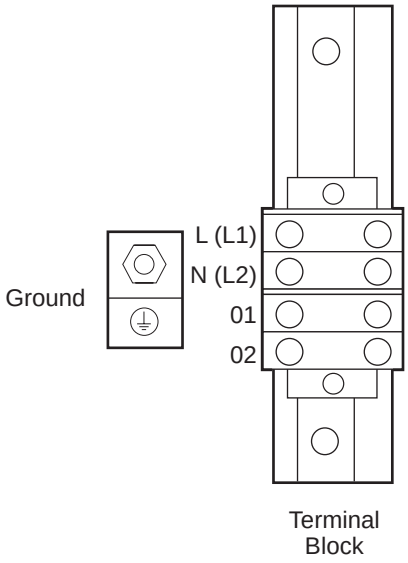



**FIGURE 2-4. Terminal Block and Grounding Connections**

a. Connect the green (ground) wire to the ground terminal.

b. Connect the black or brown (live) wire to L (L1) terminal.

c. Connect the white or blue (neutral) wire to N (L2) terminal.

### PROCEDURE 2-6. Grounding the Branch Circuit

**Application:** Node stack in which the current to earth ground exceeds 5 mA in CP environment.

1. Install an insulated grounding conductor as part of the branch circuit that supplies the node. This conductor is identical in size, insulation material, and thickness to the grounded and ungrounded branch-circuit conductors. The only exception is that it is green or green with yellow stripes.
2. Ground the grounding conductor to earth at the service equipment or other acceptable building earth ground.
3. The attachment-plug receptacles in the vicinity of the node must be a grounding type. Connect the grounding conductors serving those receptacles to earth ground at the service equipment or other acceptable building earth ground.

### PROCEDURE 2-7. Installing the Power Entry Module

**Application:** All nodes.

**Requirements:** Series M2 Shelves use the ED3P302-30,G4 (for AC); Series M1 shelves use the ED3P302-30,G5 (for AC).

Install the power entry module before plugging in the line cord. Always power down the shelf before removing its power module.

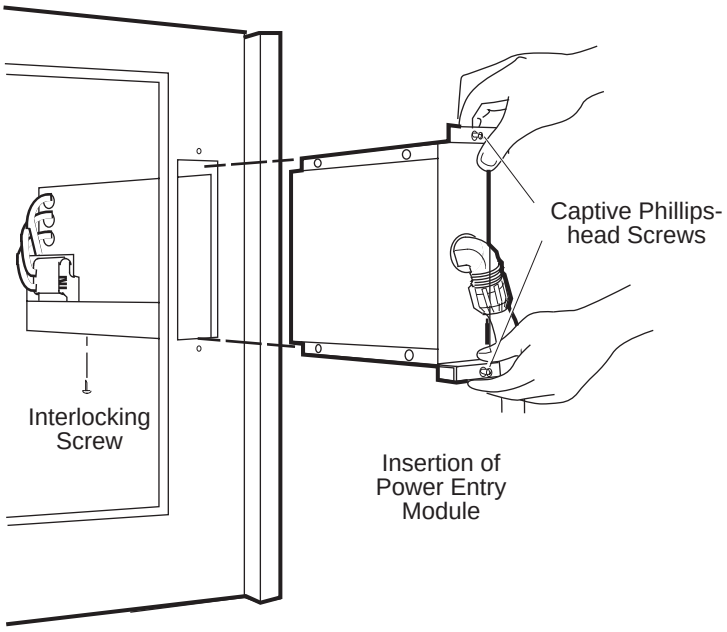



**FIGURE 2-5. Inserting the Power Entry Module**

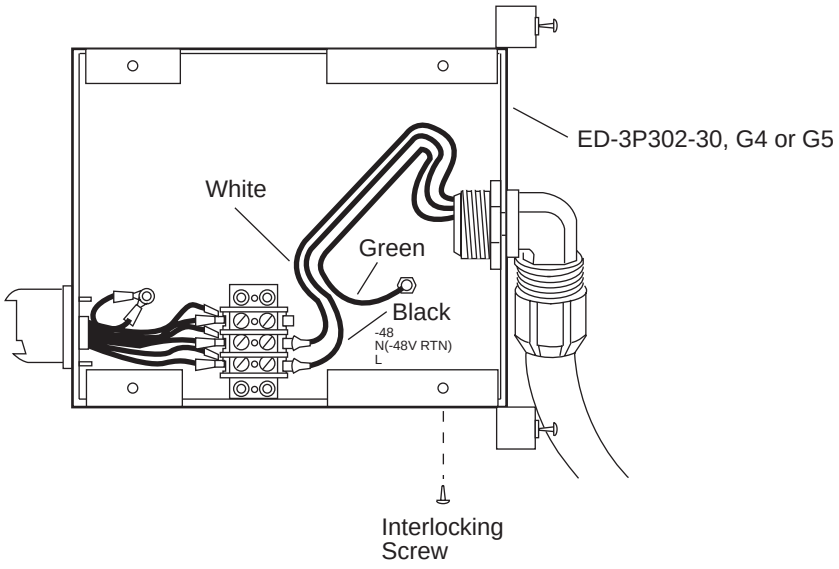
1. Remove the interlocking screw from the bottom of the housing.
2. Slide the module into its recess until the connector seats.
3. Tighten the two captive Phillips-head screws on the back of the module.
4. Install the interlocking screw through the hole in the slide and tighten it.
5. Removal is done in the reverse order.

### PROCEDURE 2-8. Wiring the Power Entry Module With a Base Power Unit

**Application:** Nodes with a Base Power Unit.

**Requirements:** Series M2 Shelves use the ED3P302-30,G4 power entry module; Series M1 shelves use the ED3P302-30,G5 power entry module.

1. Remove the power entry modules from each shelf. (Keep track of the shelf type from which the power entry module was removed.)
2. Connect the appropriate length of line cord (ED2P324-30,G25 through G28) to each power entry module.
    a. Connect the green wire to the grounding lug near the opening of the power entry module.




### FIGURE 2-6. Wiring the Power Entry Module

    b. Connect the white wire to the neutral, N(–48V RTN), terminal.
    c. Connect the black wire to the live, L, terminal.
3. Re-install the power entry modules in the shelves.
4. Install cord retainer brackets on all shelves except the topmost shelf:
    a. Hold the bracket with the two grooved tabs to the left, so the cord retainer is to the lower right of the bracket.

**PROCEDURE 2-8. Wiring the Power Entry Module With a Base Power Unit** (continued)

b. Unscrew the two captive Phillips-head screws on the rear of the power entry module. Pull the screws out toward you, but do not remove them from their captive nut.

c. Insert the two tabs of the bracket under the screws; then tighten the screws.

5. Insert the line cords into the cord retainer brackets. Insert the longest cord first; work from top to bottom and feed the cords down toward the Base Power Unit.
6. Insert the line cords through the appropriate holes on the rear door of the Base Power Unit. (The holes are marked with shelf numbers.)
7. Open the rear door of the Base Power Unit and plug the line cords into the appropriate connectors.
8. Close the rear door of the Base Power Unit.
9. To complete the installation of shelves and power wiring for the CP node, go to Procedure 2-13, Inserting and Removing Power Supplies.

## Installing and Wiring Shelves in a CO Frame

DC-powered shelves are mounted in a CO frame; see the following figure. Four shelves slide into the CO frame on guides. Each frame is equipped with fusing for power distribution to the shelves. The Alarm Relay Unit (ARU) and all the shelves that were ordered are already mounted in the frame before it is shipped. Mounting hardware for any open positions in the frame is also included.

For two-stack nodes, two frames are installed adjacent to one another. Exposed sides are masked with side covers.

Two identical, rectangular panels cover the sides of the frame. Two narrow panel strips, called stiles, cover the edges of the side panels, the flanges of the frame guides, and all the holes on the front upright. Front and rear kickplates protect the shelves from being bumped by other office equipment, and have cutouts for AC outlets. Outlet boxes are provided, but AC wiring and outlets are not.

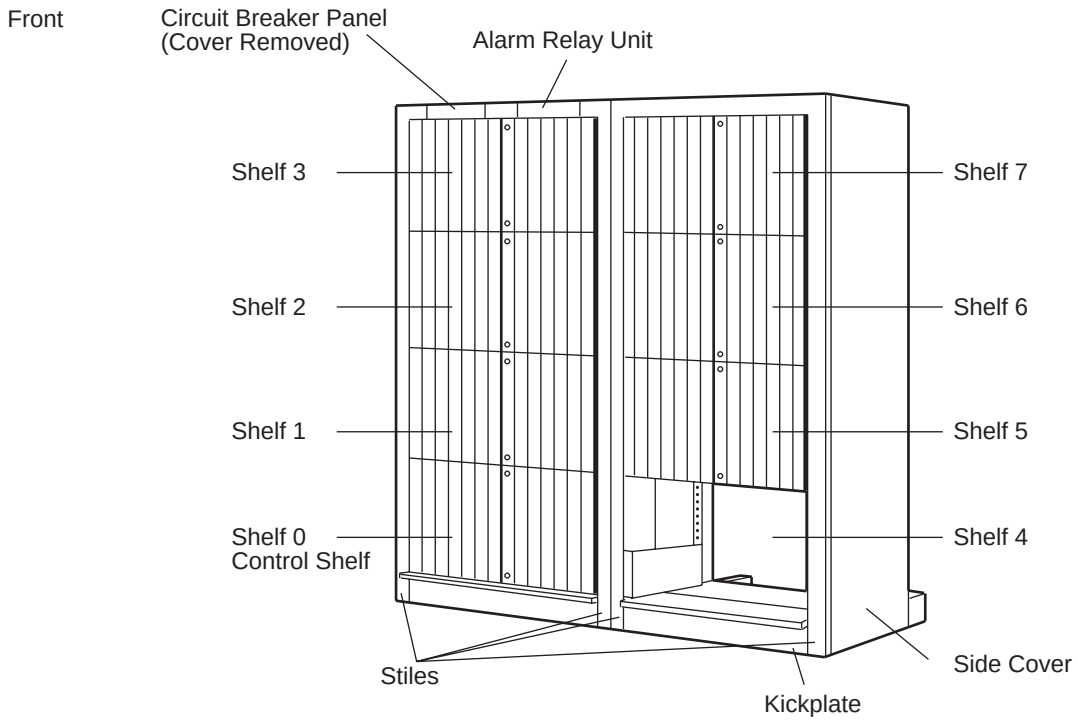



**FIGURE 2-7. CO Frame Front and Rear Views**

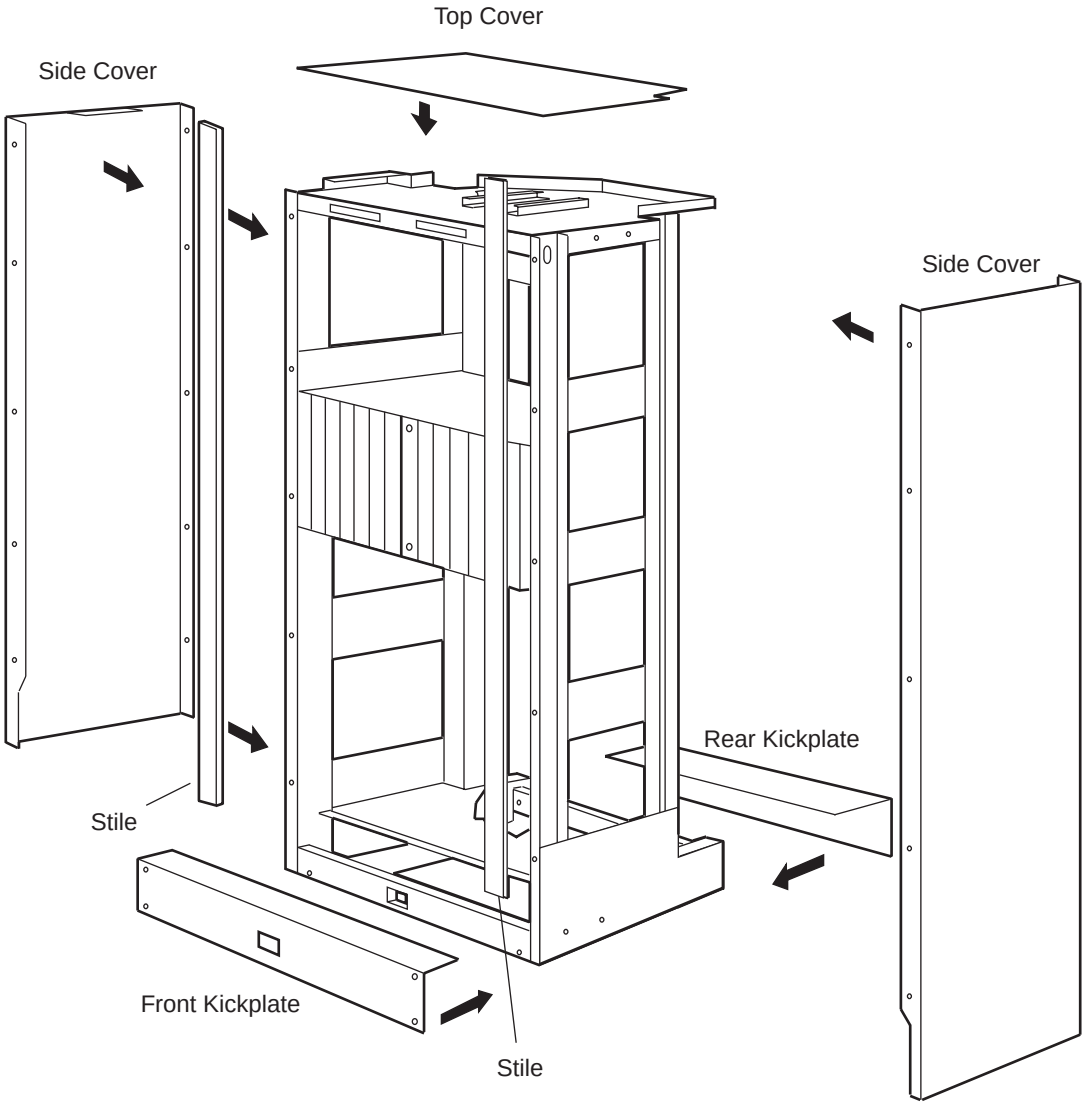



**FIGURE 2-8. CO Frame Covers**

The CO frame accommodates the R-3407A (5ESS dollies); see the following figure. The following three procedures describe how to install covers and kickplates, how to mount and secure the CO frame, and how to insert and remove shelves.

The –48/–60 VDC CO building power is fed to a terminal strip at the top of the CO frame, with a separate connection for each feed, A through D. From the terminal strip, wires lead to individual fuses on the front panel. The following table summarizes valid DC power hardware and service combinations for the node.

**TABLE 2-12. DC Power Service Combinations**

| Connection Method | DC Voltage | Country |
|---|---|---|
| Wiring harness to frame. | –41 to –60 | Canada, Europe, Taiwan, USA |

**PROCEDURE 2-9. Installing Covers and Kickplates on a CO Frame**

**Application:** Node installed in CO frame.

1. Two identical, rectangular covers are used for each frame. Place five thread-cutting screws (provided with covers) in each upright and one on the top to hold the covers in place.

   On a two-frame node, where the frames are in contact or very near each other, install side covers only on the outside of the frame.

2. The stiles are held in place with clips. To install a stile, press it against the upright with the bottom about an inch above the floor and slide it down until the clips catch.

3. Slide the kickplates horizontally into place and use the two screws provided to attach the rails to the frame. The front rail is shorter; it fits between the uprights.

**PROCEDURE 2-10. Installing the CO Frame**

**Application:** CO frame-mounted nodes.

**NOTE:** If a hoist is unavailable, remove the shelves from the frame before attempting to move the frame off the skid.

1. Remove the front and rear kickplates from the frame to expose the access holes in the base of the frame.

2. Unbolt the frame from the packing skid.

**PROCEDURE 2-10. Installing the CO Frame** (continued)

3. Using dollies, move the frame to its final position and lower it to the floor. Install one R-3407A dolly on each corner as follows:
   a. Pull the latch back and slip the pins into the holes on the frame base; see the following figure.
   b. Turn the thumbwheel to clamp the dolly tightly against the frame.
   c. Extend the casters, gradually, in each corner to keep the frame near vertical.
   d. Reverse this sequence to remove the dolly.

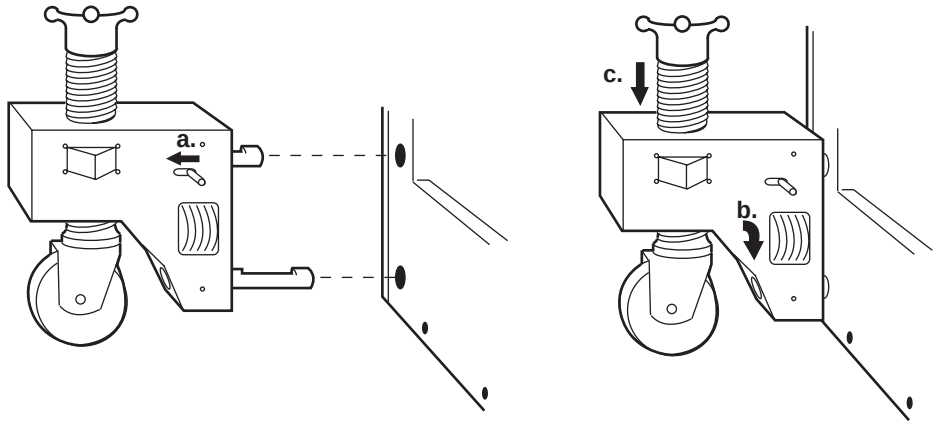



**FIGURE 2-9. Moving the CO Frame**

4. There are four bolt positions in each corner of the base, but only one bolt is needed in each corner. The other three positions are for alternative use in case an obstruction is hit. If the frame is being installed on a reinforced concrete floor, mark all four positions in each corner; see the following figure. On other floors, mark only the position designated 1.
5. Move the frame away from the marks to drill the holes.
6. Drill position 1 first. If an obstruction is hit, try positions 2, 3, or 4.
7. Install the anchors (provided with the frame) into the drilled holes.

**PROCEDURE 2-10. Installing the CO Frame** (continued)

8. Move the frame into position over the holes and bolt the frame to the floor using the hold down, insulator, and spacers provided; see the following figure.

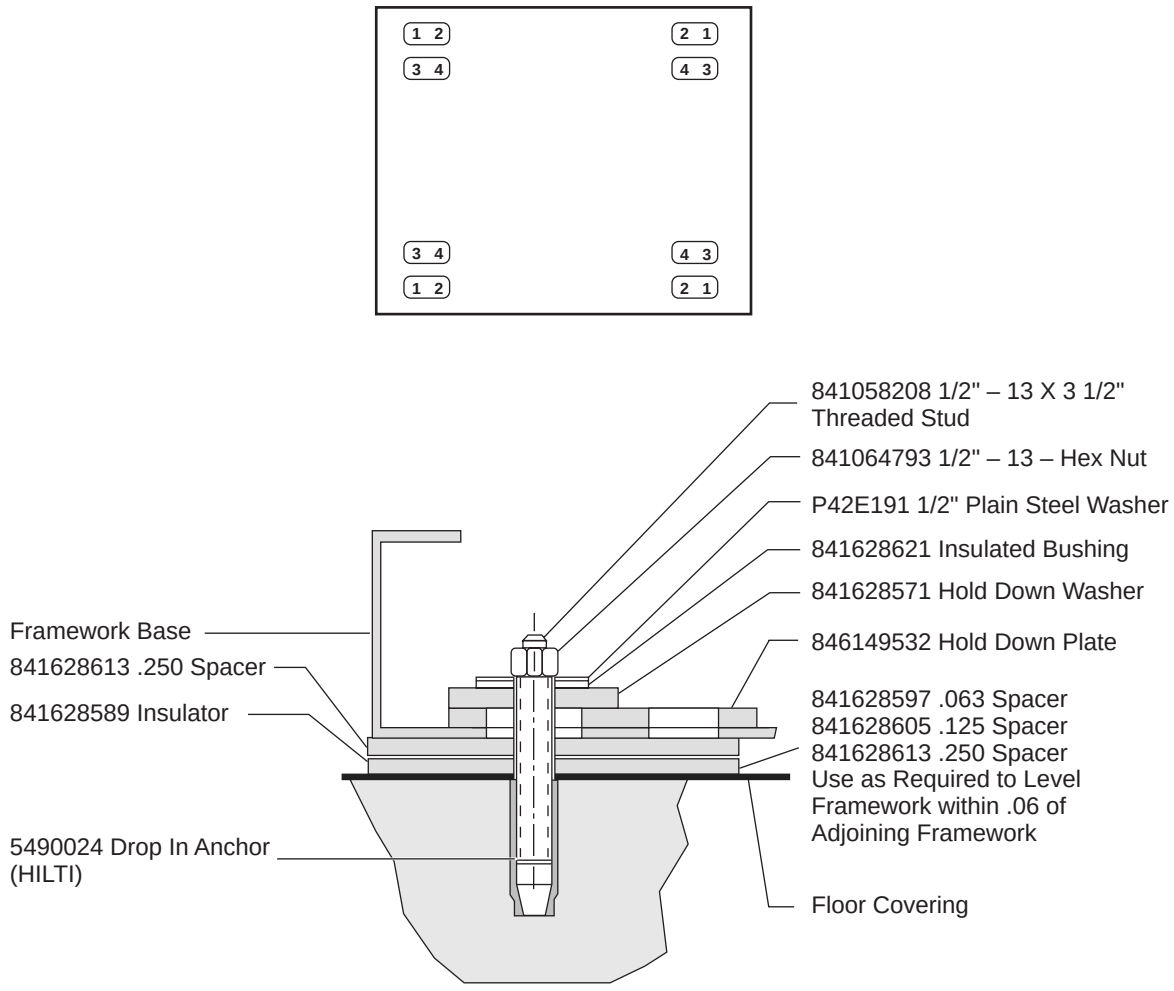



**FIGURE 2-10. Securing the CO Frame**

**PROCEDURE 2-10. Installing the CO Frame** (continued)

9. When two or more adjacent frames are installed, the frames must be bolted to each other as well as to the floor. When bolting the frames together, remove the side covers on the adjacent sides of the frames.
10. There are four holes on the sides of the frame, two near the top and two near the bottom. Bolt the right frame to the left frame using the hex bolts and lock washers provided with the frame.
11. Re-install the front and rear kickplates and the shelves (if required).
12. *If a frame extension is required,* bolt the extension bracket to the top of the frame using the hex bolts, lock washers and flat washers provided with the frame.

    Snap the front cover for the extension bracket to the front of the extension bracket.

---

**PROCEDURE 2-11. Inserting and Removing Shelves in the CO Frame**

**Application:** CO frame-mounted nodes.

**Requirements:** Always install the bottom shelves first and the top shelves last—work up from the bottom.

1. Determine the position of the new shelf in the frame.
2. Stile panels cover the front sides of the frame, and a header panel covers the front of the top of the frame (just below the frame extension, if any).

   Unsnap and remove the stile and header panels.
3. Unscrew and remove the mounting brackets for this shelf position. These screws are machine tightened at the factory. *Use a wrench, not a screwdriver to remove them.*
4. Unscrew and remove the cable mounting bracket from the rear of the frame.
5. Attach the two mounting brackets to the shelf using the eight 12-24 x 1/2 pan-head machine screws provided with the frame when originally installed. (Use pan-head screws; other screw types will interfere with installation.)
6. Lift the shelf to the level of the guides on which it is to be mounted and then slide it carefully into position.

**PROCEDURE 2-11. Inserting and Removing Shelves in the CO Frame** (continued)

7. Re-attach the mounting brackets to the frame; see the following figure.

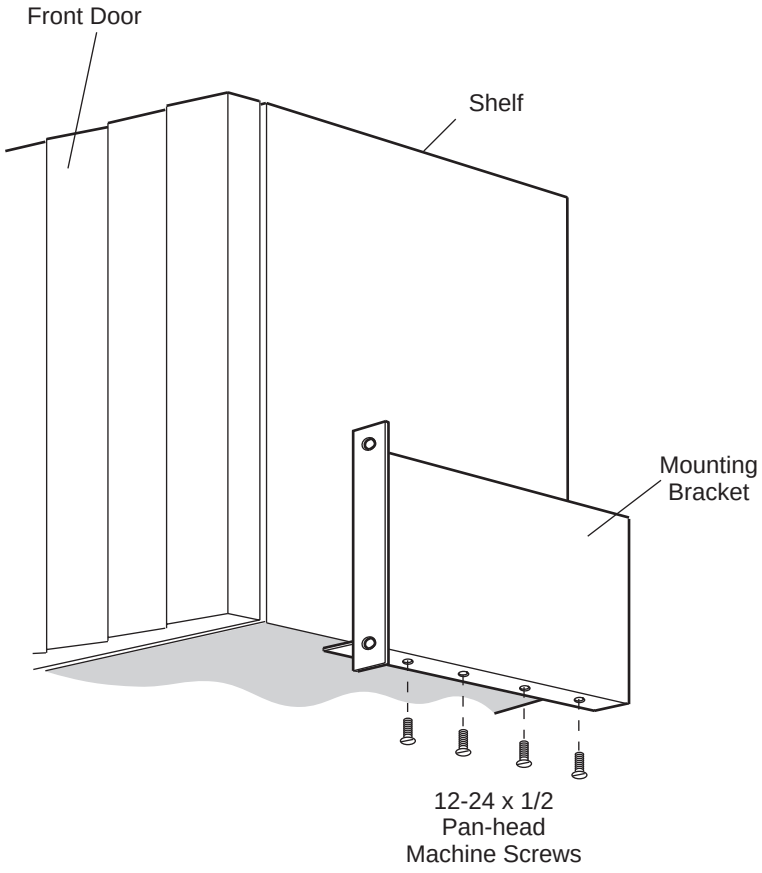



**FIGURE 2-11. Attaching Shelf Brackets**

**PROCEDURE 2-11. Inserting and Removing Shelves in the CO Frame** (continued)

8. Remove the four fuses which correspond to the location of the shelf being installed; see the following figure.

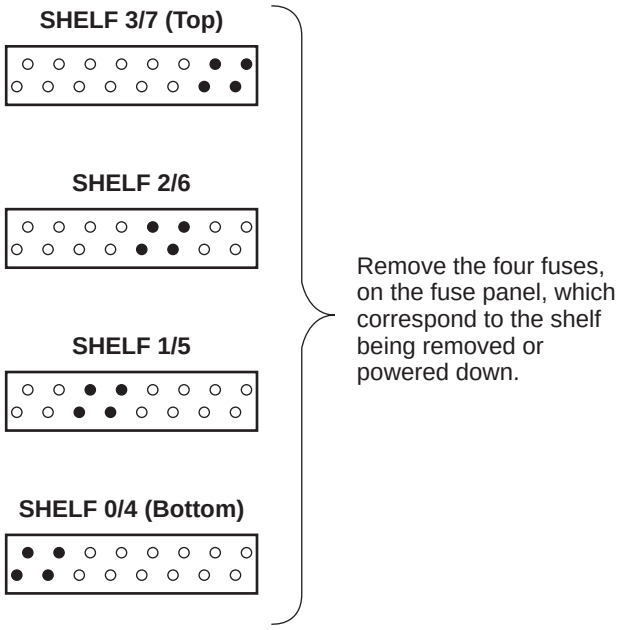



**FIGURE 2-12. CO Frame Fuse Diagram**

9. Remove the power entry module from the rear of the shelf:
   a. Remove the interlocking screw from the bottom of the ED3P302-30,G6 or G7 (DC) power entry module housing; see the figure that illustrates wiring the power entry module.
   b. Loosen the two captive Phillips-head screws on the back of the module.
   c. Slide the module out of the shelf.
10. Remove the cover from the power entry module.
11. Remove the nut from the fitting at the end of the power cable and insert the cable through the hole in the power entry module.

**PROCEDURE 2-11. Inserting and Removing Shelves in the CO Frame** (continued)

12. Secure the fitting to the power entry module by tightening the nut.
13. Connect the power cable to the connector inside the power entry module.
14. Connect the green wire to the grounding lug.
15. Replace and tighten the screws on the power entry module cover.
16. Re-install the power entry module in the shelf; *do not tighten the screws*.
17. Seat the power cables from the shelves below the shelf being installed in the bracket.
18. Install cord retainer brackets on power entry modules for all shelves except the bottom shelf:
    a. Hold the bracket with the two grooved tabs to the left, so the cord retainer is to the lower right of the bracket.
    b. Insert the two tabs of the bracket under the screws on the power entry module; then tighten the screws.
19. Re-install the fuses removed in step 8.
20. Re-install the stiles and header panels.
21. *To remove a shelf,* reverse these steps.

---

**PROCEDURE 2-12. Making CO Frame Power Connections**

**Application:** CO nodes.

**Requirements:** Use #6 AWG conductors for the grounding connections.

Always wire all four feeds, A through D, regardless of the number of shelves in the frame. Each feed must be provided with approved overcurrent protection not to exceed 60 amps.

1. The ED3P302-30,G6 and G7 power entry modules accept the –48/–60 VDC input power for CO installations. Make the wiring and ground connections shown in the following figure.
2. Ground the CO frame at a single point. Grounding points are available on both sides of the top. In two-frame installations, the frames are connected by a ground conductor, and the node as a whole is grounded to the building ground from a single point only.

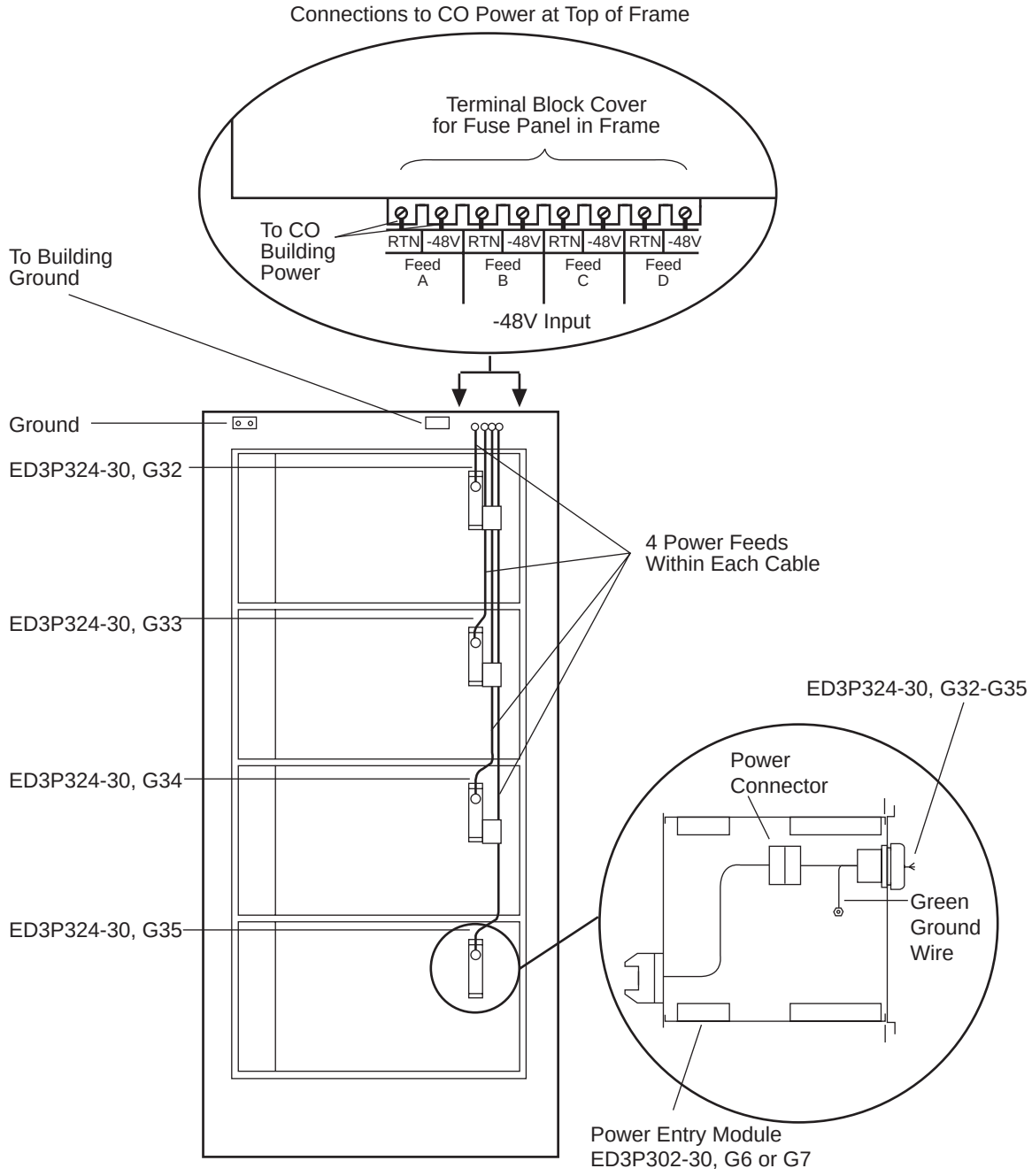



**FIGURE 2-13. Power Wiring in the CO Frame**

## Shelf Power Supply Installation

For –48/–60 VDC input power, the DCX1836 power supply is used. All installations with AC input power use the 611C or ACX582 power supply.

### PROCEDURE 2-13. Inserting and Removing Power Supplies

**Application:** All nodes.

1. Loosen the screws on the power cord cover.
2. Fold down the power cord cover so that it does not block the slot for the power supply unit.
3. Slide the interlock tab over the power receptacle and pull the latch down.
4. Slide the unit into the card guide until it seats on the pin field. If it does not seat easily, remove it and check for bent pins or other obstructions.
5. When the unit is seated, push the latch up and move the interlock tab over the latch.
6. Plug a power cord from the power entry module into the receptacle on the power supply.
7. Fold up the power cord cover and tighten the screws.
8. Reverse the process to remove the power supply.

## Applying Shelf and Address Labels

The address and slot labels for shelves in the node are distributed on large sheets.

### PROCEDURE 2-14. Applying Labels

**Application:** All nodes.

1. Refer to the *Planning Guide* to determine the configuration for the node. Choose the set of labels that matches the shelf type. The slot designation label sheets provide 12 sets of labels for the maximum of eight shelves in the node:
   - one set of labels for the BNS-2000 Series M2 Switch Shelf
   - one set of labels each for up to five BNS-2000 Series M2 Extension Shelves
   - one set of labels for the Series M1 Control Shelves
   - one set of labels each for up to six BNS-2000 Series M1 Port Shelves
   - one set of labels each for up to seven BNS-2000 VCS Series M1 Port Shelves

   Use the add-on labels for the CCM and the tape drive that reside in the Control Shelf.

**PROCEDURE 2-14. Applying Labels** (continued)

2. As a set, the labels number the slots from 0 to 127, which are the logical numbers used for node administration. Refer to the *Planning Guide* to determine the slot numbers for the shelf being labeled.
3. Apply the labels. Each label strip takes up the entire length of the mounting space.

   For Series M2 Shelves, the **shelf front** labels go on the plastic strip in the center of the shelf, and the **shelf rear** labels go on the outer sides of the shelf where the positions are marked.

   For Series M1 Shelves, the **shelf front** labels go on the front surface just below the modules inside the front door, and the **shelf rear** labels go on the horizontal part of the inner frame, just below the lower tabs of the I/O boards.

   For Series M1 Control Shelves, apply the clear overlay labels to locate the Control Computer. These overlay labels are placed above the slot number labels.
4. Repeat steps 1 through 3 until all shelves are labeled. Unused labels should be stored flat for future use.
5. Place the shelf function labels on the lower right corner of the shelf door. There are 12 shelf function labels:
   - one label for the BNS-2000 Series M2 Switch Shelf
   - five labels for BNS-2000 Series M2 Extension Shelves
   - one label for the BNS-2000 or BNS-2000 VCS Series M1 Control Shelf
   - one label for the redundant BNS-2000 or BNS-2000 VCS Series M1 Control Shelf
   - six labels for BNS-2000 Series M1 Port Shelves
   - seven labels for BNS-2000 VCS Series M1 Port Shelves
6. Clear overlay labels are provided for shelf numbering. Place the shelf number labels in the box provided on the shelf function label.

# Node Module and I/O Board Installation

This section describes the standard data connections for critical module I/O boards, node alarm cabling, fan and ARU power cabling, console and printer connections including *StarKeeper* II NMS, installation of all module types, and cable management. It includes the following:

- setting options (switches and jumpers) on modules and I/O boards
- inserting and removing I/O boards
- cabling critical modules and their I/O boards
- cabling Control Computer I/O boards
- installing and removing modules

The procedures in this section apply whether a node is located in a central office (CO) or other site (CP), but vary by Control Computer configuration.

## Handling Modules and I/O Boards

I/O boards and modules should always be handled by the edges to prevent accidental damage. Never touch the circuit contacts. When handling any circuit board, wear a properly grounded ESD wrist strap.

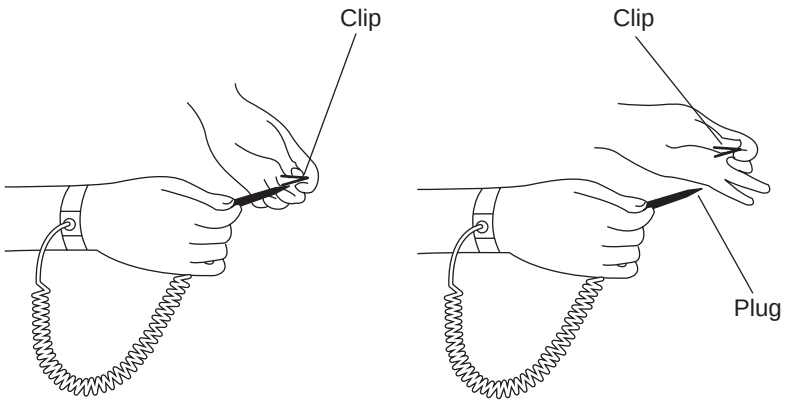



**FIGURE 2-14. Use of ESD Wrist Strap**

Attach the clip or plug (shown in the previous figure) of the wrist strap to the grounding jack on the shelf.

For Series M2 Shelves, grounding jacks are located at the front of the shelf on the lower right corner, and at the rear of the shelf in the upper rear right corner.

For Series M1 Shelves, grounding jacks (labeled ESD) for the wrist strap are located at the front of the shelf to the right of the last module slot, and at the rear of the shelf near the fuse modules to the right of the slot area.

See the **Node Maintenance** chapter for additional handling guidelines.

## Setting Options on Modules and I/O Boards

The following table specifies the I/O board used with each module in the Control Computer complex. It also indicates if the module or I/O board has switches or jumpers that must be set, the cabinet/shelf type, and the number of the *physical* slot in which the modules and I/O boards are placed.

**TABLE 2-13. CCM System Critical Modules and Corresponding I/O Boards**

| Designation | Module | Switches | I/O Board | Switches | Physical Slot Number |
|---|---|---|---|---|---|
| Switch modules/ Stratum 4 Clock | CMA1 | No | CNA1 and CMC3 | Yes | Series M2 Switch Shelf; slots 0/A and 0/B (up to 3 Series M2 Extension Shelves) |
| | CTG13 | No | CNA7 | No | Series M2 Switch Shelf; slots 0/A and 0/B; includes Stratum 4 (STR4); (4 to 5 Series M2 Extension Shelves) |
| | | | CUW1 | Yes | CUW1 in Slots in Rear of CNA7 |
| CIM | CMA2 | No | CMC2 | Yes | Series M2 Switch Shelf; slots 3–9 |
| ECC I/O board | — | — | CNA2 | No | Series M2 Extension Shelf (configurations with 1 to 3 shelves) slot 1 |
| | — | — | CNA8 | No | Series M2 Extension Shelf (configurations with 4 or 5 shelves) slot 1 |
| CTRM | TN2096 | Yes | ASP7B | Yes | Series M1 Shelves; slot 15 |

**TABLE 2-13. CCM System Critical Modules and Corresponding I/O Boards** (continued)

| Designation | Module | Switches | I/O Board | Switches | Physical Slot Number |
|---|---|---|---|---|---|
| Clock* | TN1001B | No | ASP1 | Yes | Switches on ASP1 to identify cabinet always in highest slot |
| Eswitch* | TN2099 | No | None | No | Series M1 Control Shelf; slot 1 |
| Repeater* | TN1003 | No | ASP1 | Yes | Switches on ASP1 to identify cabinet |
| CCM (MRCIO) | TN2235 | No | CTS1 | No** | Slot 13 or 14 |
| (no MRCIO) | | | CTS2 | No | Slot 13 or 14 |
| Tape Drive (DDS) | TN2233 | No | CSD9 | No | Slots 11–12 or 12–13*** |
| External Tape (DDS) | ED3P325-30,G407 | No | None | No | External device |

* BNS-2000 VCS nodes only.

** CTS1 has a toggle switch only.

*** The tape drive can reside in any two slots as long as the cable reaches the controller; or it can be external, freeing slots for interfaces.

**TABLE 2-14. ECPU System Modules and Corresponding I/O Boards**

| Designation | Module | I/O Board | Physical Slot Number* |
|---|---|---|---|
| SCSI/DKI module | UN635B | ASP4B | slot 14 (BNS-2000)<br>slot 14,30 (BNS-2000 VCS) |
| ECPU module | MC1D138A1 | AWJ15 | slot 13 (BNS-2000)<br>slot 13, 29 (BNS-2000 VCS) |
| Disk Drive | TN2175B | AWJ12 | slot 11 (BNS-2000)<br>slot 11, 27 (BNS-2000 VCS) |
| Tape Drive | TN2097 | ASP8 | slot 9 (BNS-2000)<br>slot 9, 25 (BNS-2000 VCS) |
| MRCM | TN2109C | AWJ16B | slot 7<br>(BNS-2000 and BNS-2000 VCS) |
| Clock module** | TN1001B | ASP1 | Switches on ASP1 to identify cabinet; always in highest slot |
| Eswitch module** | TN2099 | None | slot 1 |
| Repeater module** | TN1003 | ASP1 | Switches on ASP1 to identify cabinet |
| Switch modules/ Stratm 4 | CMA1 | CNA1 and CMC3 | slots 0/A and 0/B (BNS-2000)<br>Series M2 Switch Shelf<br>(up to 3 Series M2 Extension Shelves) |
| | CTG13 | CNA7 | slots 0/A and 0/B (BNS-2000)<br>Series M2 Switch Shelf<br>includes Statum 4 (STR4);<br>(4 to 5 Series M2 Extension Shelves) |
| | | CUW1 | in slots in rear of CNA7 |
| CIM | CMA2 | CMC2 | slots 3-9 (BNS-2000)<br>Series M2 Switch Shelf |
| ECC I/O board | — | CMA2 | slot 1 (BNS-2000)<br>Series M2 Extension Shelf<br>(configurations with 1 to 3 shelves) |
| | — | CNA8 | slot 1 (BNS-2000)<br>Series M2 Extension Shelf<br>(configurations with 4 to 5 shelves) |
| CTRM | TN2096 | ASP7B | slot 15 (BNS-2000)<br>Series M1 Shelves |

* Physical position in the control shelf.

** BNS-2000 VCS nodes only.

Before inserting the I/O boards or modules, set their switches or jumpers. The directions *right* and *left* in this section apply when the I/O board is held with the backplane connector to the left, the interface connectors to the right, and the switches or jumper pins facing you. A slide switch is moved in the specified direction. A rocker switch is pushed in on the specified side. Jumper pins are inserted to connect the holes indicated.

**NOTE:** Some boards appear functional with improperly set switches. Always verify that switches are set correctly.

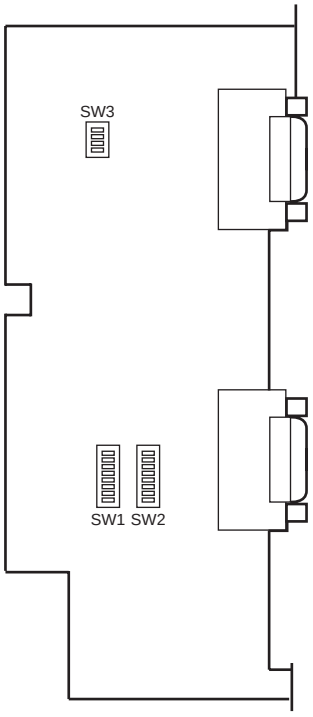



**FIGURE 2-15. Sample I/O Board With Switches**

The following sections, which are arranged in alphabetical order, provide detailed explanations of the switch settings for CCM and ECPU critical modules and I/O boards.

***ASP1 (Clock/Repeater I/O Board for BNS-2000 VCS CCM and ECPU Nodes).*** The switches on the ASP1 I/O board identify the shelf number to the Control Computer.

---

**PROCEDURE 2-15. Setting Switches on the ASP1**

1. Set the appropriate switch settings for each shelf using the tables in this section.
2. Install the I/O board behind the Clock/Repeater slot and secure it.
3. Connect the cables; see the section on Bus and Clock Cabling.
4. Insert the Clock/Repeater module.

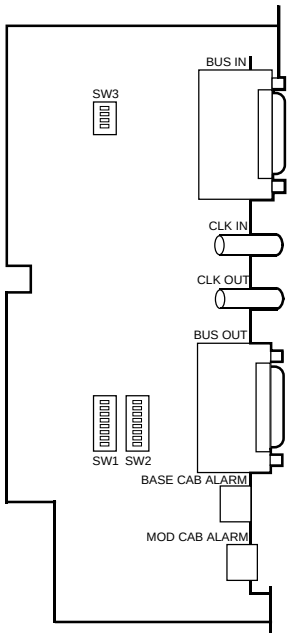



**FIGURE 2-16. ASP1 I/O Board**

### TABLE 2-15. ASP1 Switch 1 Settings

| ASP1 Switch Position | Setting for All Cabinets in a Node |
|---|---|
| 1.1 | ON |
| 1.2 | ON |
| 1.3 | ON |
| 1.4 | ON |
| 1.5 | ON |
| 1.6 | ON |
| 1.7 | OFF |
| 1.8 | Not used |

The settings in the following table apply to the given cabinet number regardless of the number of cabinets in the node.

### TABLE 2-16. ASP1 Switch 2 Settings

| ASP1 Switch Position | Cabinet Number | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2.1 | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| 2.2 | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| 2.3 | ON | ON | ON | ON | OFF | OFF | OFF | OFF |
| 2.4 | ON | ON | OFF | OFF | ON | ON | OFF | OFF |
| 2.5 | ON | OFF | ON | OFF | ON | OFF | ON | OFF |
| 2.6 | ON | OFF | OFF | ON | OFF | ON | ON | OFF |
| 2.7 | OFF | ON | ON | OFF | ON | OFF | OFF | ON |
| 2.8 | Not Used | | | | | | | |

### TABLE 2-17. ASP1 Switch 3 Settings for a Single Cabinet Node

| Switch Position | Settings |
|---|---|
| 3.1 | ON |
| 3.2 | ON |
| 3.3 | ON |
| 3.4 | Not used |

### TABLE 2-18. ASP1 Switch 3 Settings for a Multi-cabinet Node

| Switch Position | Settings | | |
|---|---|---|---|
| | Cabinet 0 | Intermediate Cabinets | Last Cabinet |
| 3.1 | ON | OFF | OFF |
| 3.2 | ON | OFF | OFF |
| 3.3 | OFF | OFF | ON |
| 3.4 | Not used | | |

The switch settings will change on the "last" cabinet when another cabinet is added to an existing node. To change the setting in the last cabinet, the Clock/Repeater module and the ASP1 I/O board must be removed, and Switch 3.3 reset.

### PROCEDURE 2-16. Changing the Switch Setting in the Last Shelf of a BNS-2000 VCS Node

1. Disable and remove the Clock module.
2. Remove the ASP1 board and change to the appropriate switch setting; see the appropriate tables previously supplied.
3. Replace the ASP1 board, and install a Repeater module.
4. Verify that the switches are set correctly on the ASP1 board in the last cabinet.
5. Install the Clock module in the last cabinet.

***ASP4B (SCSI/DKI I/O Board for BNS-2000 and BNS-2000 VCS ECPU Nodes)*** Switches 1, 2, and 3 on the ASP4B I/O board set a memory address for the Control Computer. Switches 4 and 5 enable *magic*, a property that allows a module to control backplane access.

**TABLE 2-19. ASP4B Switch Settings**

| ASP4B | |
|---|---|
| **Switch** | **Position** |
| 1 | LEFT (off) |
| 2 | LEFT (off) |
| 3 | LEFT (off) |
| 4 | RIGHT (on) |
| 5 | RIGHT (on) |

***ASP7B (CTRM I/O Board for BNS-2000 Nodes).*** Options on the ASP7B I/O board are set by switches S1, SW1, and SW2.

**TABLE 2-20. ASP7B Switch Settings**

| S1 Position | Function |
|---|---|
| UP | Fiber Loopback |
| DOWN | Normal |
| **SW1 Switch** | **Position** |
| 1 | UP (on) |
| 2 | UP (on) |
| 3 | UP (on) |
| **SW2 Switch** | **Position** |
| 1 | LEFT (off) |
| 2* | LEFT (off) |
| 3 | LEFT (off) |
| 4 | LEFT (off) |
| 5 | LEFT (off) |
| 6 | LEFT (off) |
| 7 | LEFT (off) |
| 8 | LEFT (off) |
| * If the power base status cable is connected to this I/O board, this switch must be *on*. | |

***AWJ15 (ECPU I/O Board for BNS-2000 or BNS-2000 VCS ECPU Nodes).*** The AWJ15 I/O board must be removed in order to set its switches. The switch settings depend on whether an MRCM is present or an external modem is used.

**TABLE 2-21. AWJ15 Switch Settings**

| AWJ15 with MRCM | | | |
|---|---|---|---|
| **Switch 1** | | **Switch 2** | |
| 5 | RIGHT | 5 | LEFT |
| 4 | RIGHT | 4 | LEFT |
| 3 | RIGHT | 3 | LEFT |
| 2 | RIGHT | 2 | LEFT |
| 1 | RIGHT | 1 | LEFT |

| AWJ15 Directly Connected to Console without MRCM | | | |
|---|---|---|---|
| **Switch 1** | | **Switch 2** | |
| 5 | LEFT | 5 | RIGHT |
| 4 | LEFT | 4 | RIGHT |
| 3 | RIGHT | 3 | RIGHT |
| 2 | RIGHT | 2 | RIGHT |
| 1 | RIGHT | 1 | RIGHT |

| AWJ15 with External Modem Connections without MRCM | | | |
|---|---|---|---|
| **Switch 1** | | **Switch 2** | |
| 5 | LEFT | 5 | RIGHT |
| 4 | LEFT | 4 | RIGHT |
| 3 | RIGHT | 3 | LEFT |
| 2 | LEFT | 2 | LEFT |
| 1 | LEFT | 1 | RIGHT |

***CMC2 (CIM I/O Board for BNS-2000 CCM Nodes).*** The SW1 switch on the CMC2 module is enabled (set *on*) for Control Computer shelves. For port shelves, this switch is *off*.

**TABLE 2-22. CMC2 Switch Settings**

| CMC2 | |
|---|---|
| **Port Shelf** | **Control Shelf** |
| RIGHT (off) | LEFT (on) |

***CMC3 (Stratum 4 I/O Board for BNS-2000 CCM or ECPU Nodes with up to Three Series M2 Extension Shelves).*** Set the CMC3 I/O board options with bit switches and jumpers, referring to the following two tables. The following figure shows jumpers M19 and M20 on the CMC3 I/O board. Figure 2-19 shows the cabling connections, including the CMC3 I/O board, for the Series M2 Switch Shelf. For more information on primary and secondary reference sources, see **ssm4** in the *Commands Reference*.

**TABLE 2-23. CMC3 Switch Settings**

| CMC3 (Bit Settings) | |
|---|---|
| **Switch Bit** | **Position** |
| 1 | LEFT (up) |
| 2 | RIGHT (down) |
| 3 | LEFT (up) |
| 4 | RIGHT (down) |
| 5 | RIGHT (down) |
| 6 | RIGHT (down) |
| 7 | RIGHT (down) |
| 8 | RIGHT (down) |

### TABLE 2-24. CMC3 Jumper Settings

| CMC3 (Jumpers Installed) | | |
|---|---|---|
| **Jumper Location** | **North American T1 (DS1)** | **CEPT** |
| E44/E45 | install | install |
| E46/E47 | install | install |
| E48/E49 | install | install |
| E50/E51 | install | install |
| MP13 | install | — |
| MP14 | install | — |
| MP19 | install 5 gang jumper across rows 1 & 2 | install 5 gang jumper across rows 2 & 3 |
| MP20 | install 4 gang jumper across rows 1 & 2 | install 4 gang jumper across rows 2 & 3 |
| MP21 | — | install for CEPT 75 coax connection |
| MP22 | — | install for CEPT 75 coax connection |

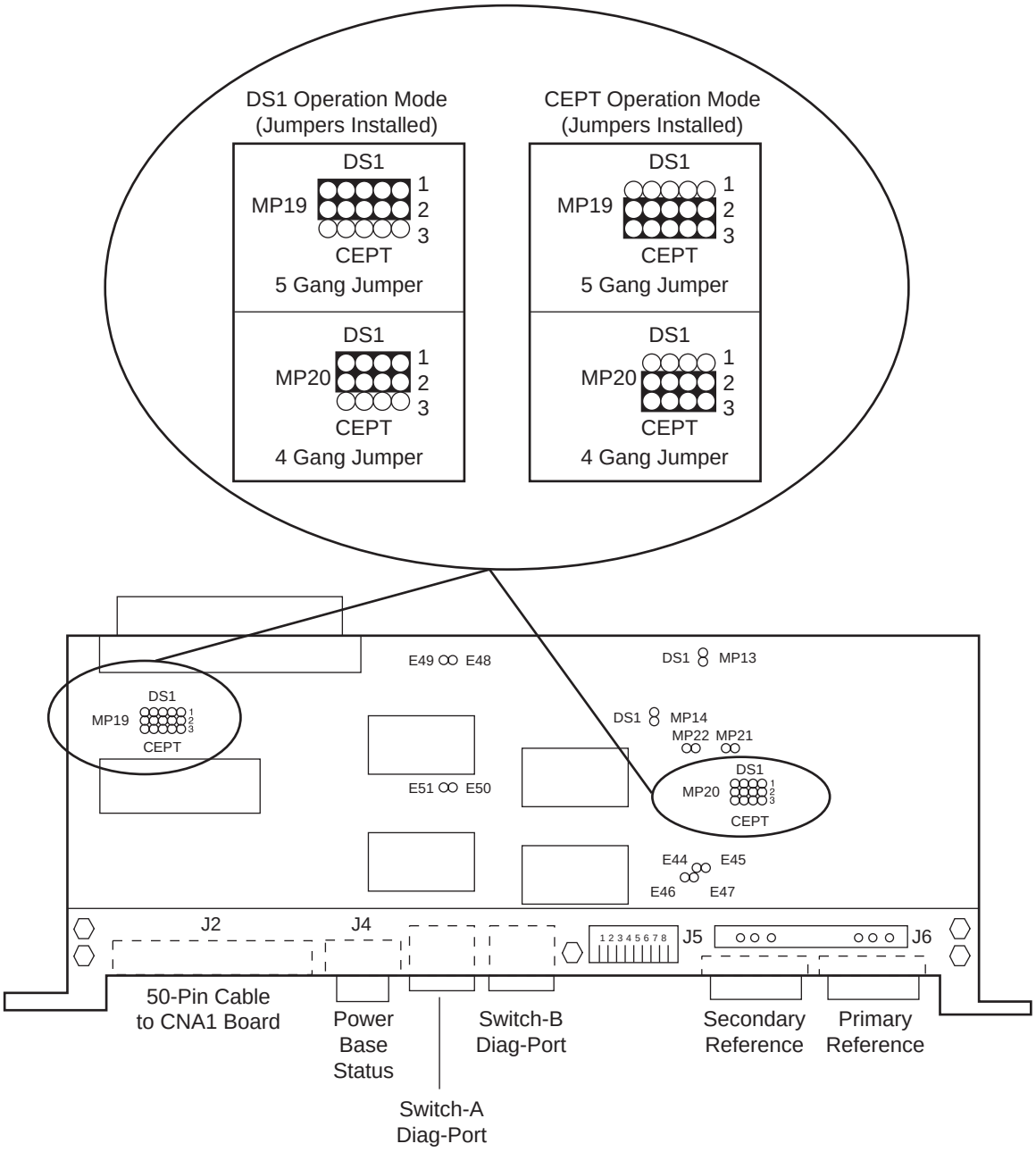



**FIGURE 2-17. CMC3 I/O Board Jumpers**

***CNA1 (Switch I/O Board for BNS-2000 CCM or ECPU Nodes with up to Three Series M2 Extension Shelves).*** Set options on the CNA1 (Switch module) I/O board with the SW1 switch to indicate if the node will run as a CEPT E1 or a North American T1 (DS1) system.

**TABLE 2-25. CNA1 Switch Settings**

| CNA1 (Version 2) | |
|---|---|
| **Position** | **Description** |
| LEFT (off) | CEPT E1 |
| RIGHT (on) | North American T1 |

***CTS1 (MRCIO I/O Board for BNS-2000 and BNS-2000 VCS CCM Nodes).*** A toggle switch on the back of the CTS1 I/O board resets the CTS1, or puts it into bypass mode. During normal operations, the reset switch should be in the center position.

***CUW1 RIB.*** The CUW1 RIB board has a switch that requires configuration. When using an E1 external clock reference signal, the switch does not have any effect for T1 and 64kcc external signals. Refer to the following table for CUW1 switch settings.

**TABLE 2-26. CUW1 RIB Switch Settings**

| Clock Reference | 75 Ohm | 120 Ohm |
|---|---|---|
| T1 | N/A | N/A |
| E1 | Away from CUW1 Faceplate | Toward the CUW1 Faceplate |
| 64 kcc | N/A | N/A |

***TN2096 (CTRM Module Board for BNS-2000 Nodes).*** Set the SW3A switches on the TN2096 module to indicate the type of shelf, Control or Port, in which the CTRM resides.

**TABLE 2-27. TN2096 Switch Settings**

| CTRM (SW3A Switch Settings) | | |
|---|---|---|
| **Switch*** | **Port Shelf** | **Control Shelf*** |
| 1 | UP (on) | UP (on) |
| 2 | UP (on) | UP (on) |
| 3 | UP (on) | UP (on) |
| 4 | UP (on) | DOWN (off) |
| * These switch settings correspond to having a Control Computer in slot 14. | | |

### ECPU System Disk/Tape Drive Settings

Different Control Computer configurations (with ECPU modules) may require bus terminating resistors to be removed on the disk/tape drives. The tape and disk drive modules have three terminating resistors (mounted on the board between the backplane connector and the drive connector on the component side), which are marked as Z1, Z2, and Z3 in the following figure.

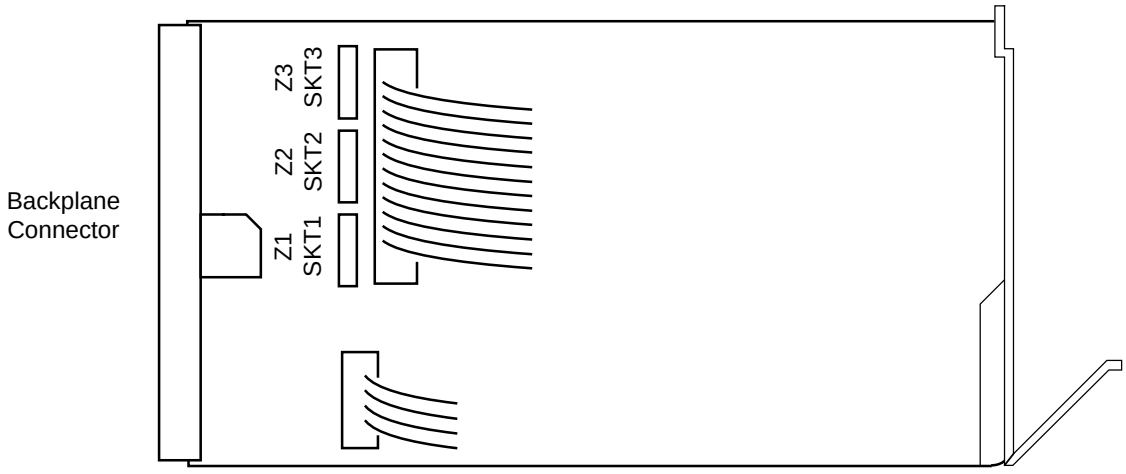



**FIGURE 2-18. Disk/Tape Drive Terminating Resistors on an ECPU System**

There are two basic ECPU systems involving the terminating resistors.

- *Dual Control Computer configuration* — remove terminating resistors from all four drives because the bus is terminated on both ends at the ASP4B I/O boards.
- *Single Control Computer configuration* — remove the terminators from the disk drive(s), and save them. Do not remove the tape drive terminators.

For BNS-2000 nodes, the disk and tape drives are printed circuit boards with faceplates similar to those of other Series M1 modules. The drives are shipped in separate packages.

## Inserting and Removing I/O Boards

I/O boards plug into the back of the shelves and are held in place by the shrouds on the pin field and two screws. Remove an I/O board only to relocate or swap the I/O board itself, or to confirm a board number or switch settings.

**CAUTION:** If the node is powered up, the I/O board corresponding to the front module *must* be in position when the front module is inserted or removed. Otherwise the circuits may be damaged.

### PROCEDURE 2-17. Inserting I/O Boards

**Application:** All Series M2 and Series M1 I/O boards.

- BNS-2000 Series M2 I/O boards are inserted horizontally, with the board's component side facing up.
- BNS-2000 and BNS-2000 VCS Series M1 I/O boards are inserted vertically with the board's component side facing left.

1. Make sure the I/O board is appropriate and the DIP switches (if any) are correctly set for the corresponding module.
2. Align the backplane connector with the pin field or card guide and the screw slots with the screw holes.

   Slip the connector onto the pins. The board should seat easily. If the board must be pushed hard, see if it is canted or if some pins are bent.
3. Insert and tighten the screws.

### PROCEDURE 2-18. Removing I/O Boards

**Application:** All BNS-2000 Series M2 I/O boards; and all BNS-2000 and BNS-2000 VCS Series M1 I/O boards.

**Reminder:** Remove the corresponding module from the front of the slot *before* removing the I/O board.

1. If the I/O board is to be removed completely, disconnect all cabling.

   Label the ends, if necessary.
2. Remove the screws in the top and bottom tabs and rock the board gently while pulling it out.

## Cabling I/O Boards for Series M2 Shelf Configurations

Series M2 Switch Shelves are connected to Series M1 Shelves via a standard ST®-ST fiber cable.

For standard switch complex configurations supporting up to three Series M2 Extension Shelves, a Series M2 Switch Shelf is connected to a Series M2 Extension Shelf via a multiple mini-coaxial cable.

For extended switch complex configurations supporting up to five Series M2 Extension Shelves, a Series M2 Switch Shelf is connected to a Series M2 Extension Shelf via a mini-coaxial cable.

### PROCEDURE 2-19. Cabling I/O Boards for a Standard Series M2 Shelf Configuration

**Application:** All BNS-2000 nodes.

1. *In the Switch Shelf*, make the following connections; see the following figure:
   a. the J2 connector on the CMC3 I/O board to the J7 connector on the CNA1 I/O board
   b. the J4 connector on the CMC3 to the Power Base Status connector on the battery charge power base (if equipped)
   c. the J6 connector to the Primary Reference Source (PRS) clock (if required)
   d. the J5 connector to the Secondary Reference Source (SRS) clock (if required).
2. *For each CIM in the Series M2 Switch Shelf*, connect a ST-ST fiber cable from the port on the CMC2 I/O board to the port on the ASP7B I/O board in the Series M1 Control or Port Shelf. The number of the Series M1 Control or Port Shelf will be the same as the slot number of the CMC2 I/O board to which it is connected.
3. *For each Series M2 Extension Shelf in configurations with up to three Series M2 Extension Shelves* , connect a multiple mini-coaxial cable from the designated port on the CNA1 I/O board in the Series M2 Switch Shelf to the designated port on the CNA2 I/O board in the Series M2 Extension Shelf.

### TABLE 2-28. Series M2 Extension Shelf Cabling for a Standard Switch Configuration

| From CNA1 Port | To CNA2 Port |
|---|---|
| J3 | Extension Shelf 1 |
| J4 | Extension Shelf 2 |
| J5 | Extension Shelf 3 |

4. Ensure that all connections are properly secured to the I/O boards. The following figure illustrates the Switch module, CIM, and CTRM connections.

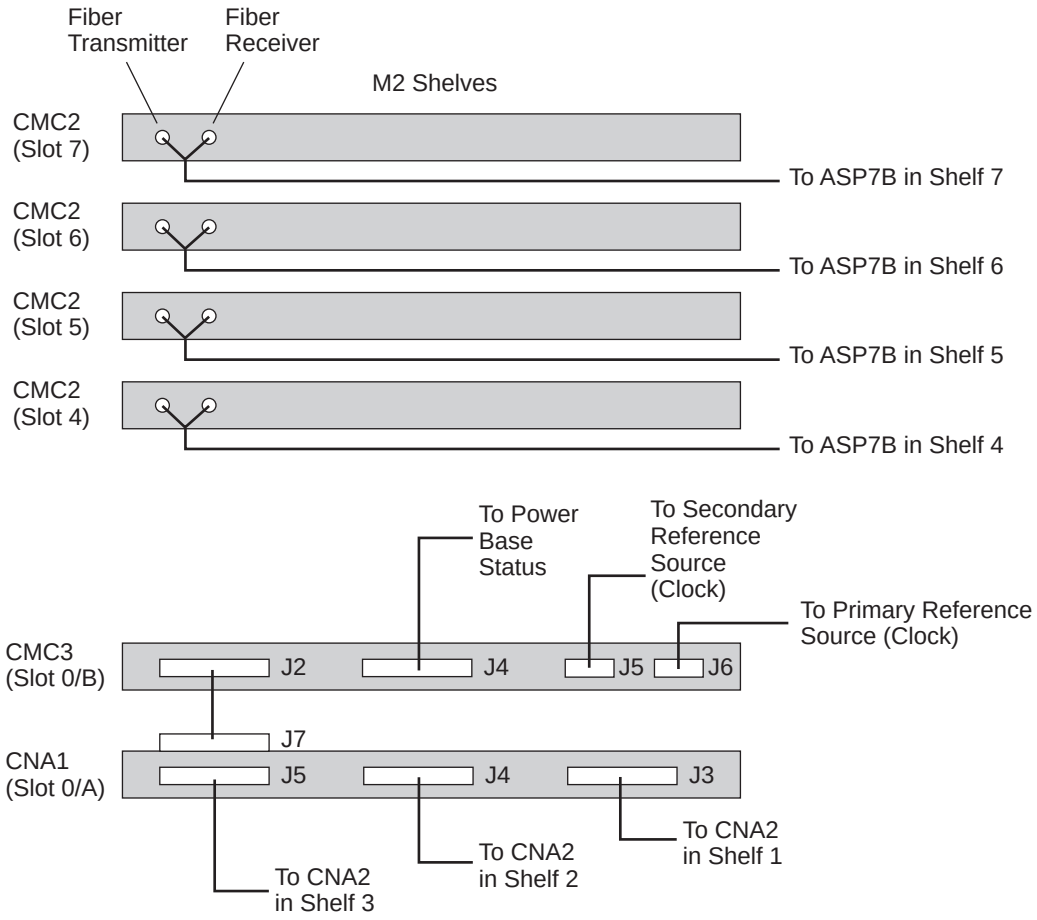



**FIGURE 2-19. Series M2 Switch Shelf Cabling Rear View (One to Three Series M2 Extension Shelf Configuration)**

### PROCEDURE 2-20. Cabling I/O Boards for an Extended Series M2 Shelf Configuration

**Application:** All BNS-2000 nodes.

1. *In the Switch Shelf*, make the following connections; see the following figure:
   a. the Primary Reference Source (PRS) to the RIBs, if required
   b. the Secondary Reference Source (SRS) to the RIBs, if required
2. *For each CIM in the Series M2 Switch Shelf*, connect a ST-ST fiber cable from the port on the CMC2 I/O board to the port on the ASP7B I/O board in the Series M1 Control or Port Shelf. The number of the Series M1 Control or Port Shelf will be the same as the slot number of the CMC2 I/O board to which it is connected.
3. *For each Series M2 Extension Shelf in configurations with four or five Series M2 Extension Shelves* , connect a mini-coaxial cable from the designated port on the CNA7 I/O board in the Series M2 Switch Shelf to the designated port on the CNA8 I/O board in the Series M2 Extension Shelf.

### TABLE 2-29. Series M2 Extension Shelf Cabling for an Extended Switch Configuration

| From CNA7 Port | To CNA8 Port |
|---|---|
| J3 | Series M2 Extension Shelf 1 |
| J4 | Series M2 Extension Shelf 2 |
| J5 | Series M2 Extension Shelf 3 |
| J6 | Series M2 Extension Shelf 6 |
| J7 | Series M2 Extension Shelf 7 |

4. Ensure that all connections are properly secured to the I/O boards. The following figure illustrates the Switch module, CIM, and CTRM connections.

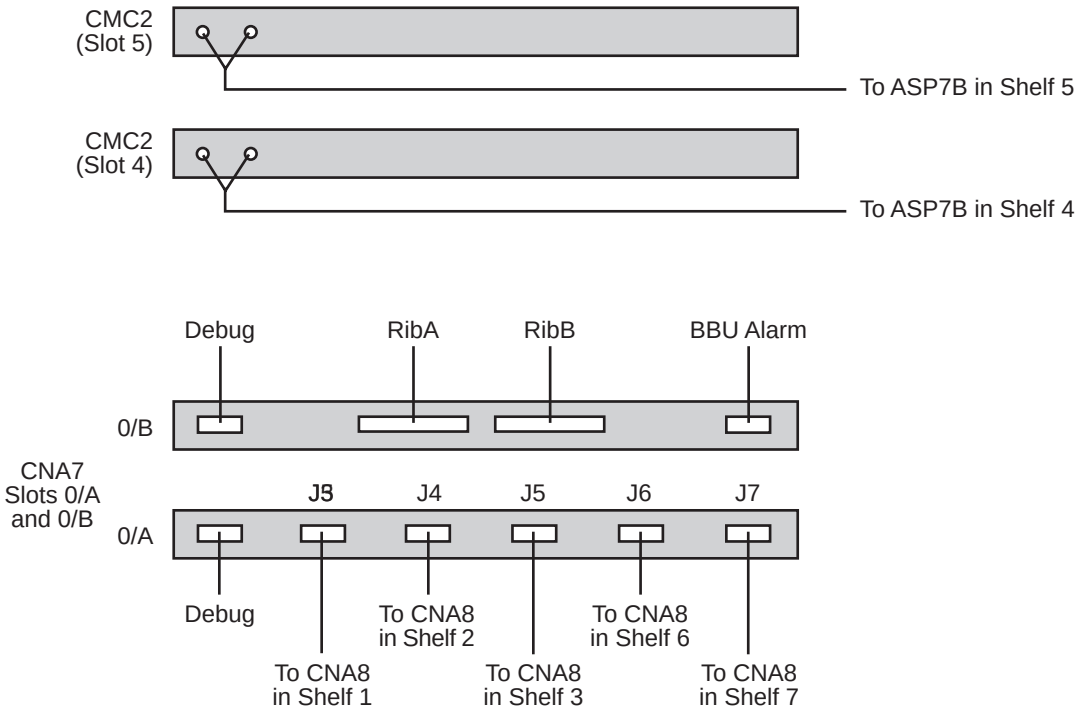



**FIGURE 2-20. Series M2 Switch Shelf Cabling Rear View (Three to Five Series M2 Extension Shelf Configuration)**

### PROCEDURE 2-21. Adding a Series M1 Shelf to an Existing Node with a Standard Switch Configuration

**Requirement:** It is not necessary to take the node down for this procedure; service will not be affected. The node can be up and running.

1. Install/stack the new Series M1 Shelf to the node.
2. Set the switch settings on the new CIM I/O (CMC2) module.
3. Insert the CIM I/O board (CMC2) in the Switch Shelf (shelf 0). The slot number must be equal to the Series M1 Shelf number.
4. Insert the CIM module (CMA2) in the Switch shelf and move the mode switch on the faceplate to the ENABLE position. The slot number must be equal to the Series M1 Shelf number.
5. Set the switches on the CTRM I/O board (the ASP7).
6. Insert the CTRM I/O board into the new Series M1 Shelf.
7. Set the SW3A switch on the CTRM.
8. Insert the CTRM (TN2096) into the new Series M1 Shelf and move the mode switch on the faceplate to the ENABLE position.
9. Connect the fiber cable between the CTRM I/O board and the CIM I/O board.
10. Administer the new Series M1 Shelf to the database by using the **enter shelf** command.
11. Use the **restore shelf** command to put the new Series M1 Shelf into service.
12. Use the **verify shelf** or the **dstat shelf** command, with the *high* option for a greater level of detail, to verify the status of newly added Series M1 Shelf.

### PROCEDURE 2-22. Adding a Series M2 Extension Shelf to an Existing Node with a Standard Switch Configuration

**Requirement:** The configuration, including the new shelf, contains from one to three Series M2 Extension Shelves. The new Series M2 Extension Shelf is powered up and equipped with the CNA2 ECC I/O board. (Connecting the intershelf cable between the Switch Shelf and the new Series M2 Extension Shelf does not affect service; therefore, it is not necessary to power down the node.)

1. *In the Switch shelf,* connect the intershelf cable (multiple mini-coaxial cable) from the J3, J4, or J5 port on the CNA1 board (back of slot 0/A) to the port on the CNA2 ECC I/O board on the Series M2 Extension Shelf. J3 is for Shelf 1; J4 is for Shelf 2; and J5 is for Shelf 3.

   See the table and figure provided in the previous procedure for additional details.

2. Use the **enter shelf** command to add the Series M2 Extension Shelf to the node database. When prompted for **SHELF TYPE** , enter *extension* and then number the shelf appropriately for your configuration.

3. Use the **diagnose shelf** command to run shelf diagnostics.

4. Use the **restore shelf** command to put the new Series M2 Extension Shelf into service.

5. Use the **dstat shelf** command, with the *high* option for a greater level of detail, to verify the status of shelf.

6. Verify the integrity of the slots in the newly added Series M2 Extension Shelf by inserting an M2 interface module, such as an AI-T3, into a slot. (It is not necessary to use an I/O board.) Use **dstat module** to verify that the correct **MODULE TYPE** is being reported. Repeat this step for each slot in the new shelf.

### PROCEDURE 2-23. Adding a Series M2 Extension Shelf to an Existing Node Configuration with Four or Five Series M2 Extension Shelves

**Requirement:** The configuration, including the new shelf, contains from four to five Series M2 Extension Shelves. The new Series M2 Extension Shelf is powered up and equipped with the CNA8 I/O board. (Connecting the intershelf cable between the Switch Shelf and the new Series M2 Extension Shelf does not affect service; therefore, it is not necessary to power down the node.)

1. *In the Switch shelf,* connect the high density intershelf cable from the appropriate port on the CNA7 board (back of slot 0/A) to the port on the CNA8 I/O board on the Series M2 Extension Shelf. J3 is for Shelf 1; J4 is for Shelf 2; J5 is for Shelf 3; J6 is for Shelf 6; J7 is for Shelf 7.

   See the table and figure provided in the previous procedure for additional details.

2. Use the **enter shelf** command to add the Series M2 Extension Shelf to the node database. When prompted for **SHELF TYPE** , enter *extension* and then number the shelf appropriately for your configuration.

3. Use the **diagnose shelf** command to run shelf diagnostics.

4. Use the **restore shelf** command to put the new Series M2 Extension Shelf into service.

5. Use the **dstat shelf** command, with the *high* option for a greater level of detail, to verify the status of shelf.

6. Verify the integrity of the slots in the newly added Series M2 Extension Shelf by inserting an M2 interface module, such as an AI-T3, into a slot. (It is not necessary to use an I/O board.) Use **dstat module** to verify that the correct **MODULE TYPE** is being reported. Repeat this step for each slot in the new shelf.

7. Make sure that the shelf number that is displayed is the correct shelf number.

## Cabling Control Computer I/O Boards

Cabling for the Control Computer is divided into two sections, below, one for the CCM system and one for the ECPU section. Use the table and figure that matches your node configuration for single or dual Control Computers with or without MRC functions.

### CCM System Cabling

Four configurations are possible for the CCM system: single CCM without MRC, single CCM with MRC, dual CCMs on the same shelf, or dual CCMs on adjacent shelves.

In a single CCM configuration without MRC, two cables originate from the CTS2. In a single CCM configuration with MRC, two cables originate from the CTS1.

In a dual CCM configuration, six cables originate from the MRCIO (CTS1). Each cable is marked with the MRC port and Comcode corresponding to the first two columns in the dual control computer node cabling table.

For an external tape drive, use an X Tape cable, and for an internal tape drive, use an I Tape cable.

The following tables list the cables by code and function, and also list the SCSI-bus cables used in a dual Control Computer configuration. Tables are supplied for single and dual Control Computer configurations with and without MRCIOs.

**TABLE 2-30. CCM System Single Control Computer (Without MRCIO) Node Cabling**

| Description | Comcode | Connection |
|---|---|---|
| port A | ED5P055-31,G179 | connects port A of AB cable to console or workstation |
| port B | ED5P055-31,G130 and G139 | connects port B of AB cable to printer |
| | ED5P055-31,G130 | connects port B of AB cable to TY, or MSM (*StarKeeper* II NMS) |
| AB | 847671773 | CTS2 to port A, B |
| I TAPE | 847671864 | CTS2 to CSD9 |
| X TAPE | 847671880 | CTS2 to external tape drive |

### TABLE 2-31. CCM System Single Control Computer (With MRCIO) Node Cabling

| Description | Comcode | Connection |
|---|---|---|
| port A | ED5P055-31,G179 | Connects port A of ABM to console |
| port B | ED5P055-31,G130 and G139 | Connects port B of ABM cable to printer |
| | ED5P055-31,G130 | Connects port B of ABM cable to TY or MSM (*StarKeeper* II NMS) |
| port M | ED5P055-31,G130 | Connects port M of ABM cable to TY or MSM |
| | ED5P055-31,G137 and G147 | Connects port M of ABM cable to modem |
| ABM | 847671781 | CTS1 to ports A, B, M |
| I TAPE | 847671864 | CTS1 to CSD9 |
| X TAPE | 847671880 | CTS1 to external tape drive |

### TABLE 2-32. CCM System Dual Control Computer Node Cabling

| Cable Name | Comcode | Connection (I/O Board to Destination) |
|---|---|---|
| port A | ED5P055-31,G179 | Connects port A of ABM cable to console |
| port B | ED5P055-31,G130 and G139 | Connects port B of ABM cable to printer |
| | ED5P055-31,G130 | Connects port B of ABM cable to to TY or MSM (*StarKeeper* II NMS) |
| port M | ED5P055-31, G130 | Connects port M of ABM cable to TY or MSM |
| | ED5P055-31,G137 and G147 | Connects port M of ABM cable to modem |
| ABM | 847671781 | CTS1 to ports A, B, M |
| I TAPE | 847671864 | CTS1 to CSD9 |
| X TAPE | 847671880 | CTS1 to external tape drive |
| SCSI-SK | 847671799 | CTS1 secondary to CTS2 primary SCSI (between shelves) — stackable connector |
| SCSI-SK-S | 847671856 | CTS1 secondary to CTS2 primary SCSI (on same shelf) — stackable connector |
| PWR-MOL | 847671815 | CTS1 to CTS2 power (between shelves) |
| PWR-MOL-S | 847671823 | CTS1 to CTS2 power (on same shelf) |
| A1B1C1 | 847671807 | CTS1 to CTS2 (ports A, B, and control, between shelves) |
| A1B1C1-S | 847671898 | CTS1 to CTS2 (ports A, B, and control, on same shelf) |
| SCSI-PL | 847671831 | CTS1 primary to CTS2 secondary SCSI (between shelves) |
| SCSI-PL-S | 847671849 | CTS1 primary to CTS2 secondary SCSI (on same shelf) |

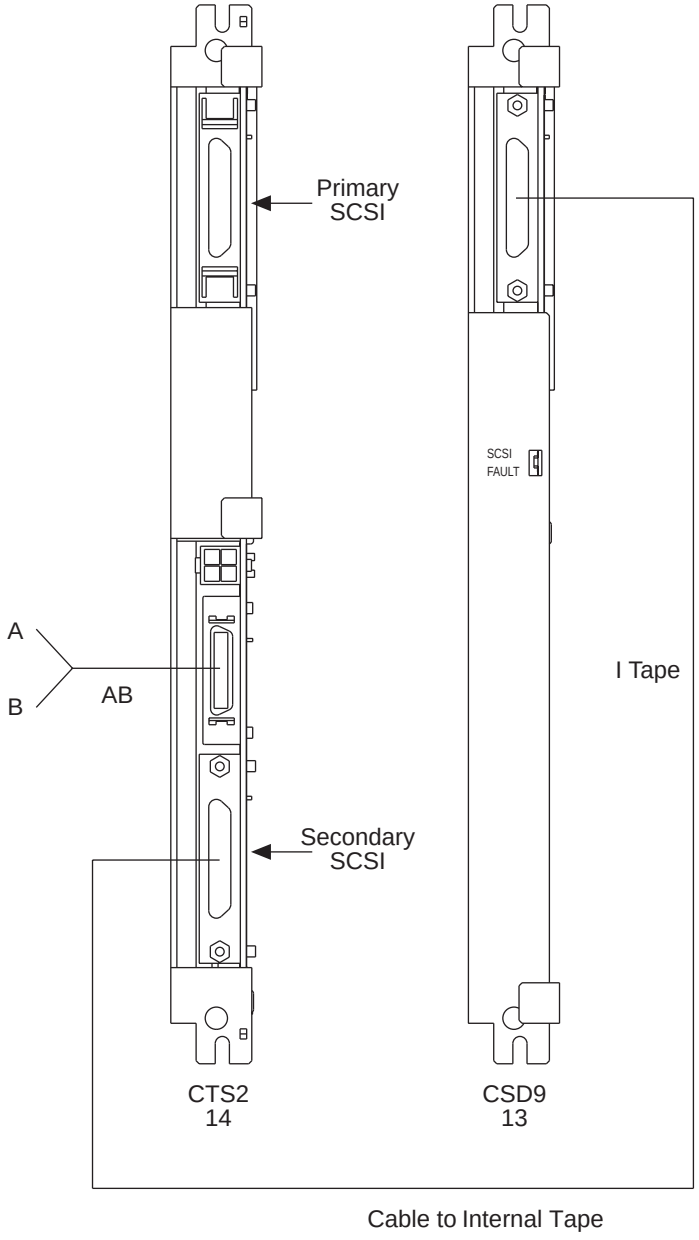



**FIGURE 2-21. CCM System Single Control Computer Node Without MRCIO**

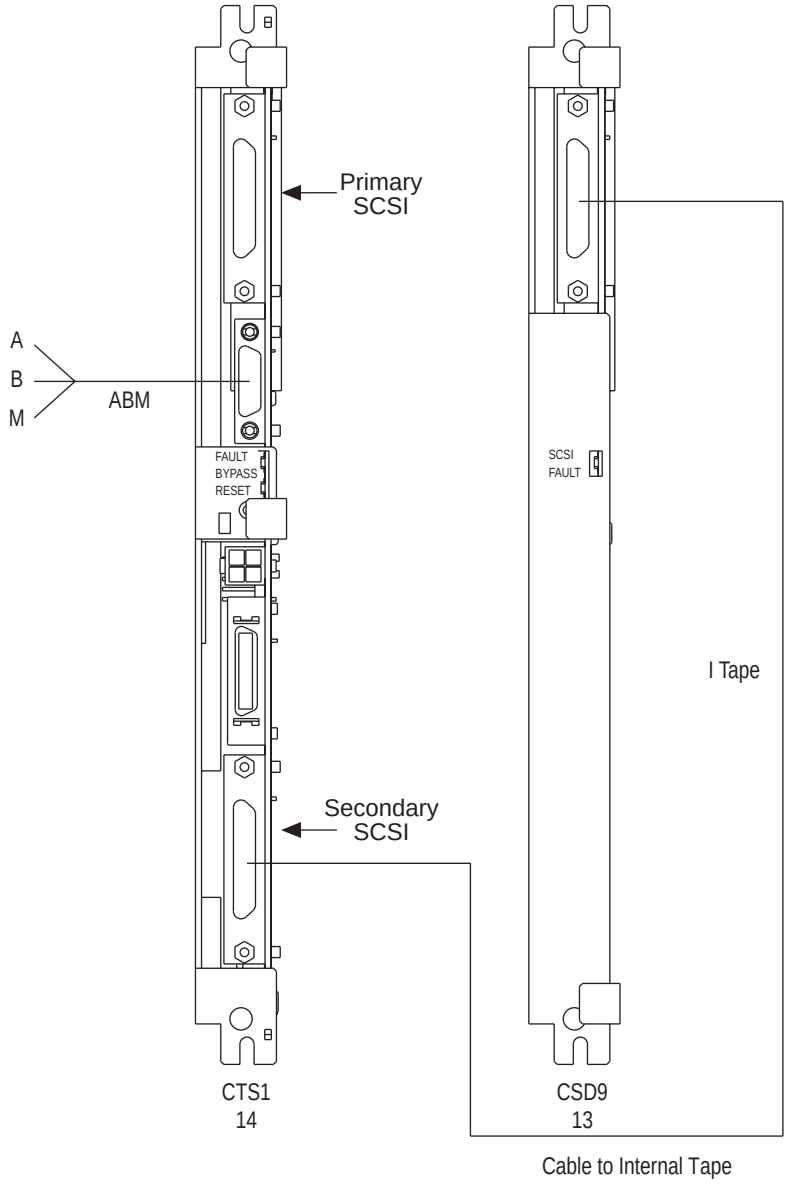



**FIGURE 2-22. CCM System Single Control Computer Node With MRCIO**

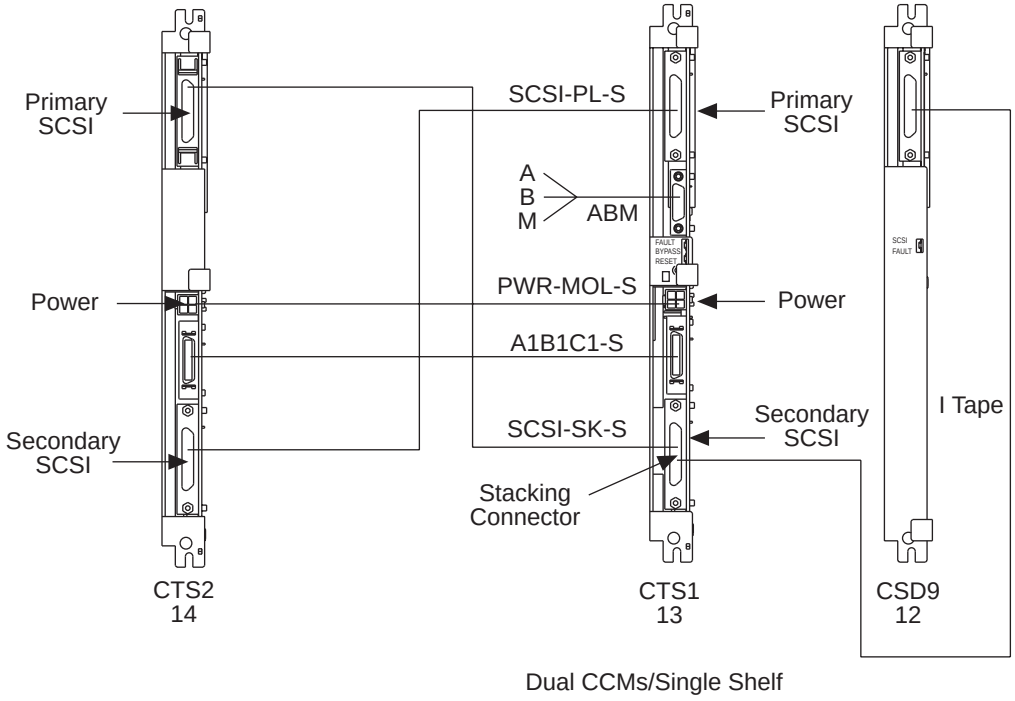



**FIGURE 2-23. CCM System Dual Control Computer Node in Single Cabinet**

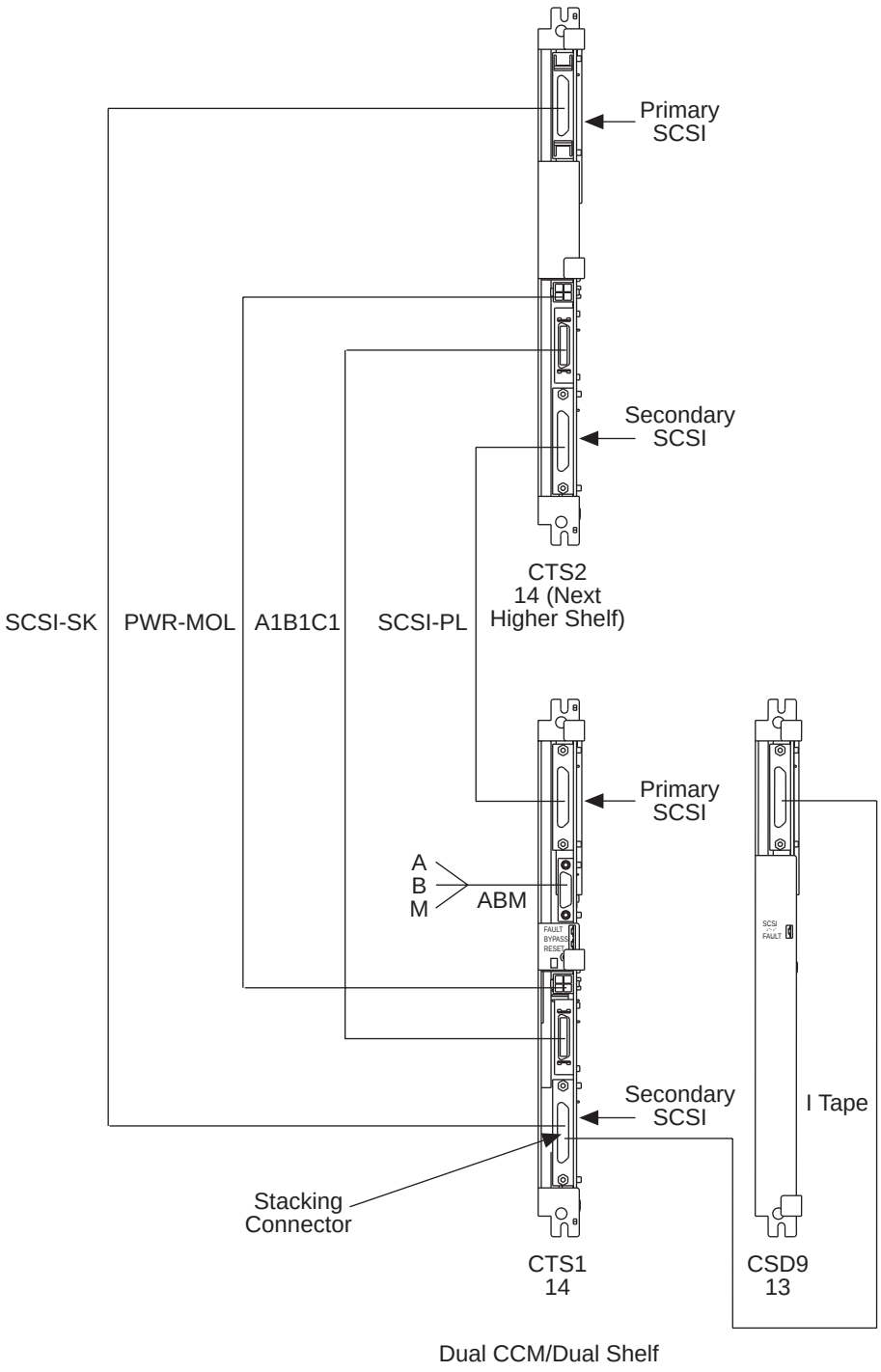



**FIGURE 2-24. CCM System Dual Control Computer Node in Dual Cabinets**

### ECPU System Cabling

Three configurations for the ECPU system are possible: single ECPU without a MRCM, single ECPU with a MRCM, or dual ECPUs with MRCM. In a single Control Computer configuration with a MRCM, six cables originate from the module.

In a dual Control Computer configuration, 11 cables (including the J7) originate from the MRCM. Each cable is marked with the MRCM port and Comcode, corresponding to the first two columns in the table.

The tables below list the cables by code and function, and also list the SCSI-bus cables and the memory-bus (M-bus) cable used in a dual Control Computer configuration. Also included are miscellaneous cables associated with node control and alarms.

**TABLE 2-33. ECPU System Single Control Computer Node Cabling Without MRCM**

| Description | Comcode | Location | Comments |
|---|---|---|---|
| port A | ED5P055-31,G179 | AWJ15 | To console or workstation. |
| port B | ED5P055-31,G130 and G139 | AWJ15 | To printer |
| | ED5P055-31,G130 | AWJ15 | TY/MSM to *StarKeeper* II NMS |
| M-bus | 843243833 | ASP4B to AWJ15 | Memory bus. |
| SCSI-Local | 846401859 | ASP4B to AWJ12/disk to ASP8/tape | Disk/tape on same shelf as SCSI/DKI. |
| **Other Non-I/O Cabling** | | | |
| Fan | —<br>— | Fan tray to ASP7B (BNS-2000)<br>Fan tray to ASP1 (BNS-2000 VCS) | Power and alarm. |
| ARU power | — | ARU to Control Cabinet | CO node only. |

## TABLE 2-34. ECPU System Single Control Computer Node Cabling With MRCM

| MRCM Cabling | | | |
|---|---|---|---|
| **MRCM Port** | **Comcode** | **Destination** | **Destination Connector** |
| B0 | 846401784 | To Port B, AWJ15 | DB-25P |
| M | ED5P055-31,G130 | To TY or MSM | DB-25 |
| | ED5P055-31,G137 and G147 | To modem | |
| B | ED5P055-31,G130 and G139 | To printer | DB-25 |
| | ED5P055-31,G130 | To TY12/MSM (*StarKeeper II NMS*) | |
| A0 | 846401768 | To Port A, AWJ15 | DB-25S |
| R0 | 846401826 | To Port R, AWJ15 | 8-pin |
| A | ED5P055-31,G179 | To workstation | DB-25 |

| Control Computer Bus Cabling | | | |
|---|---|---|---|
| **Description** | **Comcode** | **Location** | **Comments** |
| M-bus | 843243833 | ASP4B to AWJ15 | Memory bus. |
| SCSI-Local | 846401859 | ASP4B to AWJ12/disk to ASP8/tape | Disk/tape on same shelf as SCSI/DKI. |
| **Other Non-I/O Cabling** | | | |
| Fan | — | Fan tray to ASP7B (BNS-2000) | Power and alarm. |
| | — | Fan tray to ASP1 (BNS-2000 VCS) | |
| ARU power | — | ARU to Control Cabinet | CO node only. (BNS-2000 VCS) |
| ARU power | — | ARU to Cabinet 0 | CO node only. (BNS-2000) |

### TABLE 2-35. BNS-2000 VCS ECPU System Dual Control Computer Node Cabling With MRCM

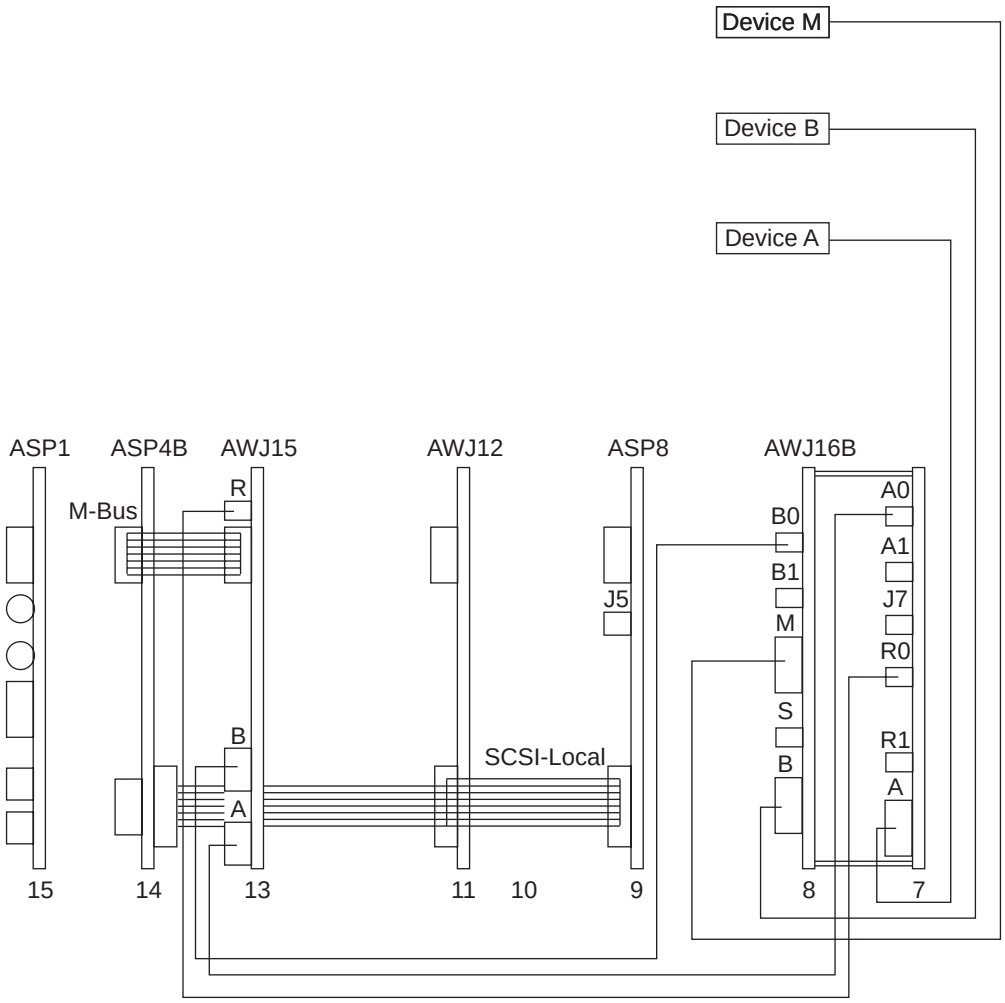
| MRCM Cabling | | | |
|---|---|---|---|
| **MRCM Port** | **Comcode** | **Destination** | **Destination Connector** |
| B0 | 846401784 | To Port B, AWJ15, Slot 13 | DB-25P |
| B1 | 846401792 | To Port B, AWJ15, Slot 29 | DB-25P |
| M | ED5P055-31,G130 | To TY or MSM | DB-25 |
| | ED5P055-31,G137 and G147 | To modem | |
| S | 846401818 | To Base Cab Alarm, ASP1, Slot 31 | DB-9S |
| B | ED5P055-31,G130 and G139<br>ED5P055-31,G130 | CTS1/2 to printer<br>CTS1/2 to TY<br>or MSM (*StarKeeper* II NMS) | DB-25 |
| A0 | 846401768 | To Port A, AWJ15, Slot 13 | DB-25S |
| A1 | 846401776 | To Port A, AWJ15, Slot 29 | DB-25S |
| R0 | 846401826 | To Port R, AWJ15, Slot 13 | 8-pin |
| R1 | 846401834 | To Port R, AWJ15, Slot 29 | 8-pin |
| A | ED5P055-31,G179 | To console or workstation | DB-25 |

| Control Computer Complex Bus Cabling | | | |
|---|---|---|---|
| **Description** | **Comcode** | **Location** | **Comments** |
| M-bus | 843243833 | ASP4B to AWJ15 | Memory bus. |
| SCSI-Local | 846401859 | ASP4B to AWJ12/disk to ASP8/tape | Disk/tape on same shelf as SCSI/DKI. |
| SCSI-Dual | 845588508 | ASP4B to ASP8/tape | Tape on other shelf. |
| **Other Non-I/O Cabling** | | | |
| Fan | — | Fan tray to ASP1 | Power and alarm. |
| ARU power | — | ARU to Cabinet 0 | CO node only. |

### TABLE 2-36. BNS-2000 ECPU System Dual Control Computer Node Cabling With MRCM

| MRCM Cabling | | | |
|---|---|---|---|
| **MRCM Port** | **Comcode** | **Destination** | **Destination Connector** |
| B0 | 846401784 | To Port B, AWJ15, Slot 77 | DB-25P |
| B1 | 846401792 | To Port B, AWJ15, Slot 93 | DB-25P |
| M | ED5P055-31,G130 | To TY or MSM | DB-25 |
| | ED5P055-31,G137 and G147 | To modem | |
| B | ED5P055-31,G130 and G139<br>ED5P055-31,G130 | printer<br>TY,<br>or MSM (*StarKeeper* II NMS) | DB-25 |
| A0 | 846401768 | To Port A, AWJ15, Slot 77 | DB-25S |
| A1 | 846401776 | To Port A, AWJ15, Slot 93 | DB-25S |
| R0 | 846401826 | To Port R, AWJ15, Slot 77 | 8-pin |
| R1 | 846401834 | To Port R, AWJ15, Slot 93 | 8-pin |
| A | ED5P055-31,G179 | To console or workstation | DB-25 |
| J7 | ED3P324-30,G40 | To ASP8 J5 connector,<br>redundant Control Computer, slot 93 | 6-pin |

| Control Computer Complex Bus Cabling | | | |
|---|---|---|---|
| **Description** | **Comcode** | **Location** | **Comments** |
| M-bus | 843243833 | ASP4B to AWJ15 | Memory bus. |
| SCSI-Local | 846401859 | ASP4B to AWJ12/disk<br>to ASP8/tape | Disk/tape on same shelf as SCSI/DKI. |
| SCSI-Dual | 845588508 | ASP4B to ASP8/tape | Tape on other shelf. |
| **Other Non-I/O Cabling** | | | |
| Fan | — | Fan tray to ASP7B | Power and alarm. |
| ARU power | — | ARU to Control Cabinet | CO node only. |




SCSI-Local ribbon cable from ASP4B to AWJ12 passes behind AWJ15 G1 board.

**FIGURE 2-25. BNS-2000 and BNS-2000 VCS ECPU System Single Control Computer Node With MRCM**

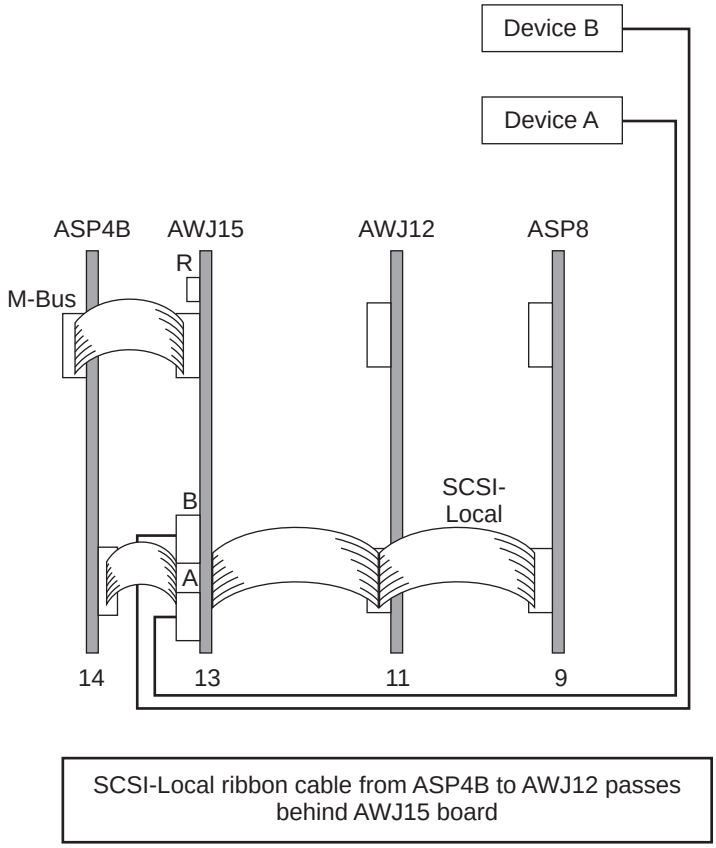
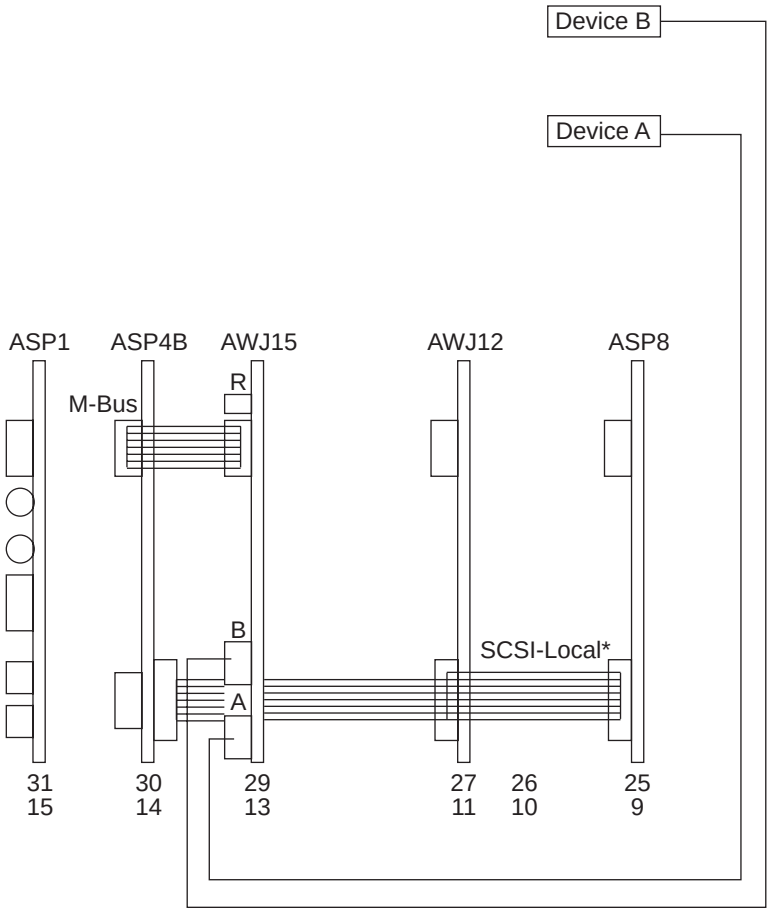



**FIGURE 2-26. BNS-2000 ECPU System Single Control Computer Node Without MRCM**




* SCSI-Local ribbon cable from ASP4B to AWJ12 passes behind AWJ15 board.

**FIGURE 2-27. BNS-2000 VCS ECPU System Single Control Computer Node Without MRCM**

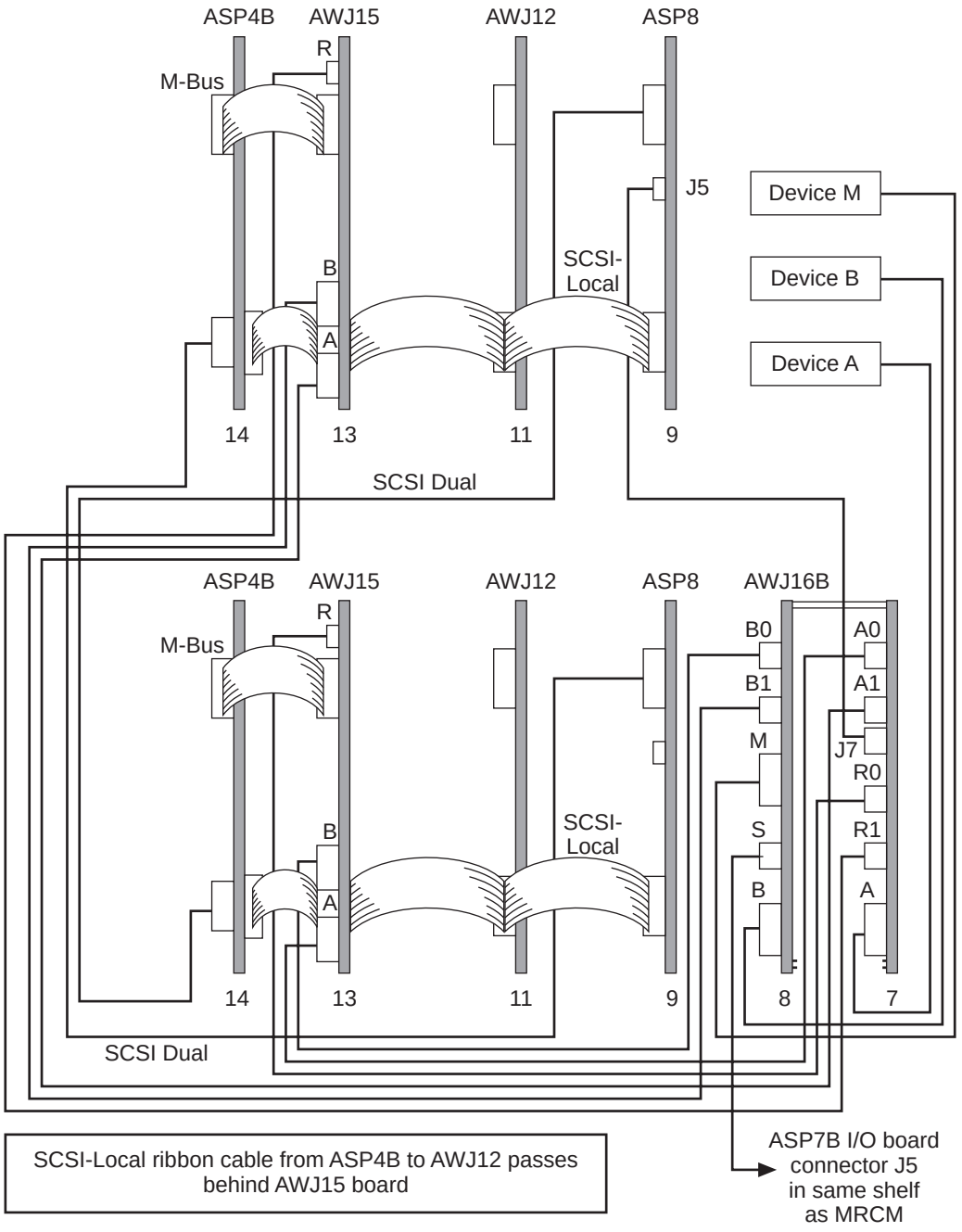
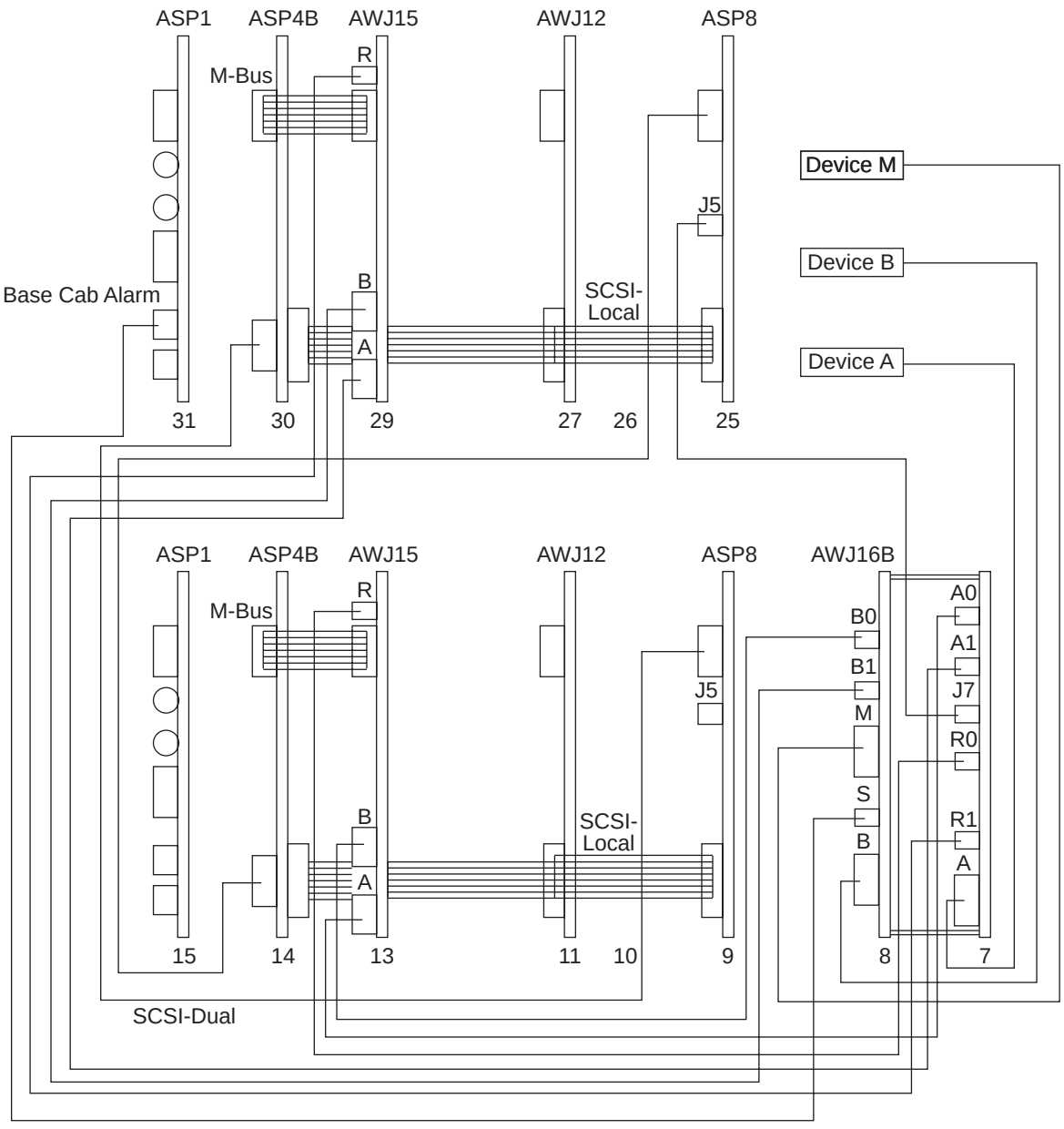



**FIGURE 2-28. BNS-2000 ECPU System Dual Control Computer Node in Dual Shelves**




SCSI-Local ribbon cable from ASP4B to AWJ12 passes behind AWJ15 board.

**FIGURE 2-29. BNS-2000 VCS ECPU System Dual Control Computer Node in Dual Shelves**

### Bus and Clock Cabling for BNS-2000 VCS Nodes

The bus and Clock cables are connected to the labeled receptacles on the ASP1 I/O board, which is installed in physical slot 15 in the back of each modular cabinet. The cable codes are as follows:

- ED2P501-30,G9 — Clock cable
- ED2P501-30,G10 — extended Clock cable
- ED2P501-30,G11 — bus cable
- ED2P501-30,G12 — extended bus cable

The bus cables are special shielded and paired cables. *Do not substitute for these cables.*

---

### PROCEDURE 2-24. Connecting Clock and Bus Cables for BNS-2000 VCS Nodes

**Application:** All BNS-2000 VCS nodes.

1. Connect a bus cable from the BUS IN plug on a given cabinet to the BUS OUT plug on the next higher-numbered cabinet. When you are finished, BUS OUT on cabinet 0 and BUS IN on the last cabinet (the one with the Clock module) remain unused. A short cable connects cabinet to cabinet within the stack. A long cable connects the top cabinet in the left-hand stack (stack 0) to the bottom cabinet in the right-hand stack (stack 1).

   **CAUTION:** The DB-25 connectors on the ASP1 I/O board are not RS-232-C ports. Connecting them to a terminal can severely damage the ASP1 I/O board and Clock or Repeater modules.

2. Connect a clock cable from the CLK IN plug on a given cabinet to the CLK OUT plug on the next higher-numbered cabinet. When you are finished, CLK OUT on cabinet 0 and CLK IN on the last cabinet (the one with the Clock module) remain unused. A short cable connects cabinet to cabinet within the stack. A long cable connects the top cabinet in the left-hand stack (stack 0) to the bottom cabinet in the right-hand stack (stack 1).

3. Bus and clock cables are dressed through the cable management area on the left as seen from the back. The cable management area is the rectangular recess in the back corners of the cabinet. The cables from the next higher cabinet enter the upper opening. The cables to the next lower cabinet exit through the lower, larger opening.

   The long cables from Cabinet 3 to Cabinet 4 pass across the bottom of Cabinet 4 to the right, up through the cable management area and into the upper opening on Cabinet 3.

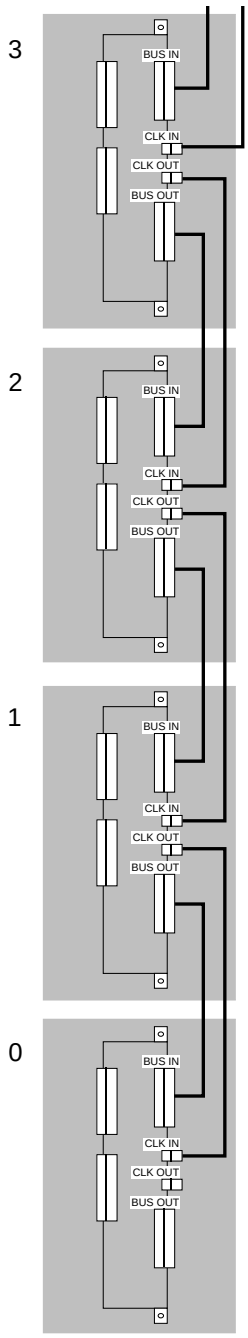



**FIGURE 2-30. ASP1 I/O Board Bus and Clock Cabling for BNS-2000 VCS Nodes**

### Alarm and Fan Cabling

Refer to the following figure for the location of alarm connections:

- *Fan power and alarm cable* — The fan cable plugs into the lowest connector receptacle on the CMC3 or ASP7B board (for a BNS-2000 node) or on the ASP1 board (for a BNS-2000 VCS node) in Series M1 Shelves.

  **CAUTION:** Failure to connect this cable will result in alarms sent to the network administrator's terminal. Continued operation with fan cable disconnected can result in cabinet overheating and circuit pack failure.

- *CO installations equipped with an ARU* — The ARU is mounted in the front panel at the top of the CO frame that houses the Control cabinet. Reach through the opening in the back of the frame to make the power and data connections to the ARU's back panel.

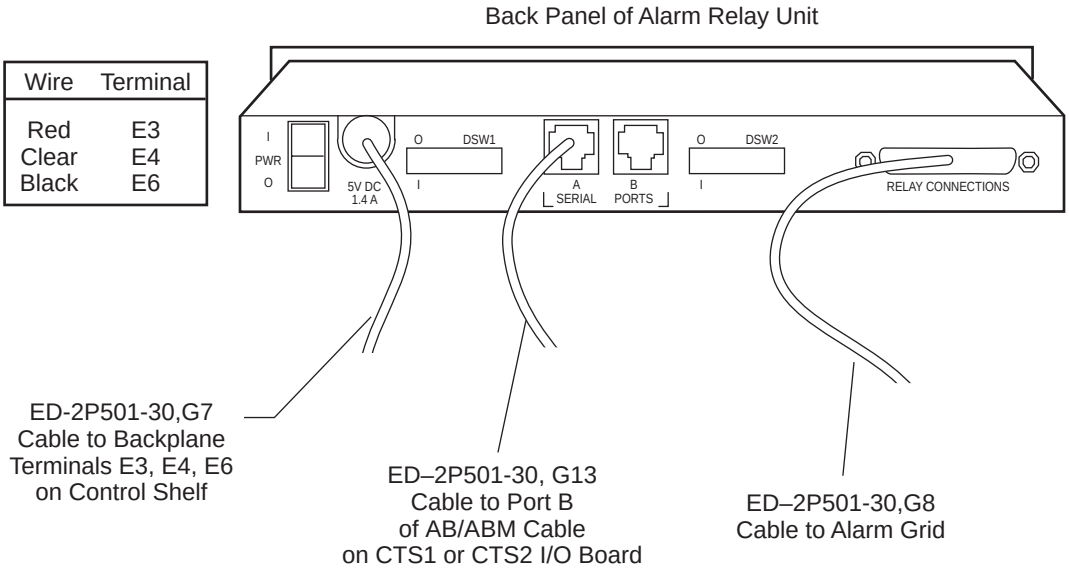



**FIGURE 2-31. CCM System Alarm Relay Unit (ARU) Connections**

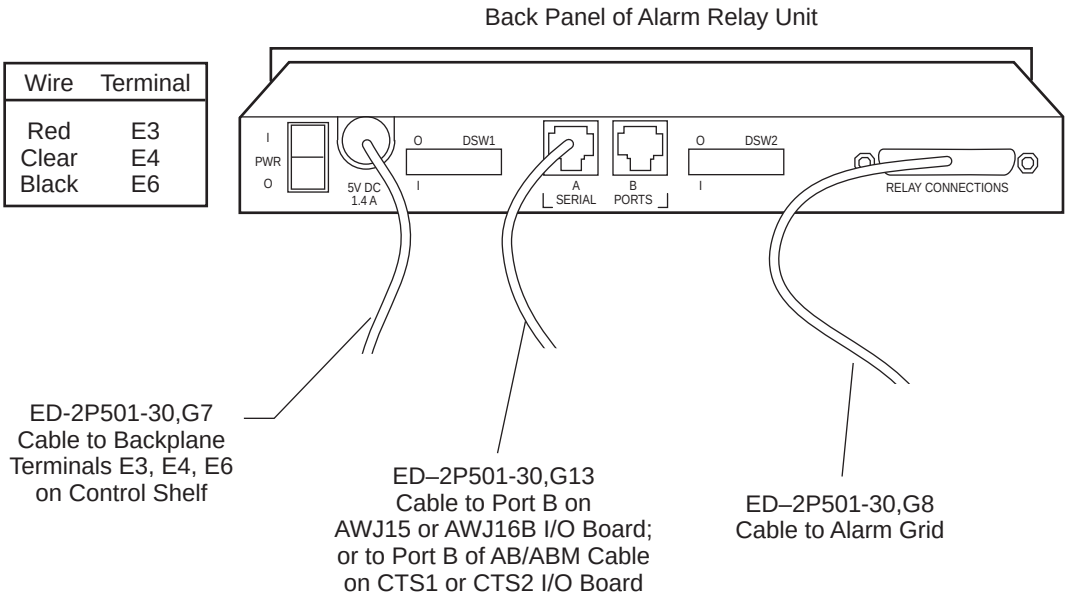



**FIGURE 2-32. ECPU System Alarm Relay Unit (ARU) Connections**

ARU power is wired from spade terminals on the backplane of the Control cabinet. On the backplane of this cabinet, to the right of the fuse boards, make the power connections to the node; see the previous figure.

When both an ARU and a printer are used, they must both be connected to port B of the Control Computer. If the printer is used without the ARU, the Y cable should not be used; a straight connection cable should be used instead.

See the Node Administrative Interface Cabling section of this chapter for more information on MRC and ARU connections.

### MRCIO Port M Connections

Consoles and printers connected directly to ports A and B of the ABM cable for the CTS1 or of the AB cable for the CTS2 are dedicated to the Control Computer and cannot communicate with endpoints connected to interface modules. Consoles connected to these ports can communicate with the MRCIO.

Port M capabilities allow node maintenance activities to be performed from a remote site as if the remote console was directly connected to port A. Port M on the MRCIO can communicate with port A of either Control Computer, and is used to communicate with the MRCIO itself. MRCIO cables are listed in the preceding tables. Port M presents DTE with default parameters: *9600 bps, ASCII, 8-bit characters*, and *no parity*.

### MRCM Port M Connections

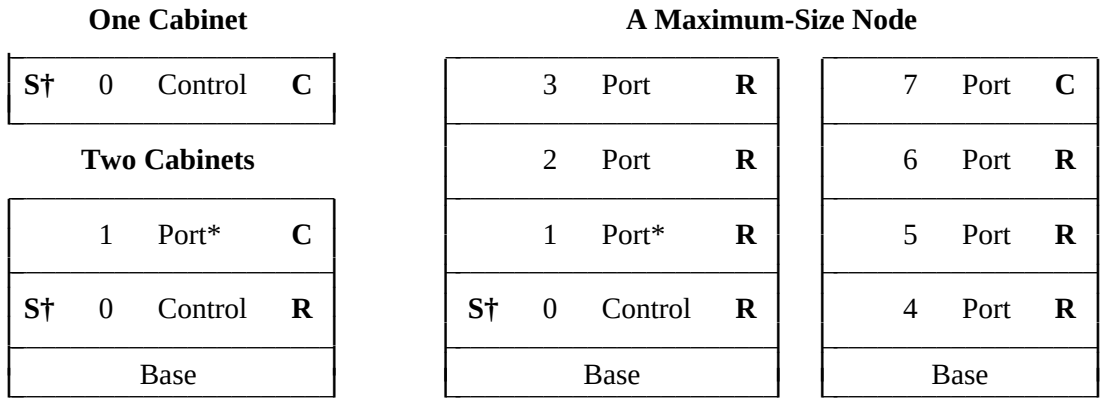
When an MRCM is installed, the output from AWJ15 ports A and B goes to MRCM ports A0/A1 and B0/B1. Port A on the MRCM is equivalent to port A on the AWJ15, and port B on the MRCM is equivalent to port B on the AWJ15. Consoles and printers connected directly to Ports A and B, either on the AWJ15 or the MRCM, are dedicated to the Control Computer and cannot communicate with endpoints connected to interface modules. Console connected to these ports can communicate with the MRCM.

Port M capabilities allow node maintenance activities to be performed from a remote site as if the remote console was directly connected to port A. Port M on the MRCM can communicate with port A of either Control Computer, and is used to communicate with the MRCM itself. MRCM cables are listed in the appropriate tables in the ECPU System Cabling section. Port M presents DTE with default parameters: *9600 bps, ASCII, 8-bit characters*, and *no parity*.

### Clock, Repeater, and Switch Module Locations (BNS-2000 VCS Node)

For BNS-2000 VCS nodes, the Clock module occupies the last slot on the right (physical slot 15) in the highest-numbered cabinet in the node (logical slots 15, 31, 47, 63, 79, 95, 111, or 127). The Repeater module occupies physical slot 15 in all the lower-numbered cabinets. Switches must be set on the ASP1 I/O board for the Clock/Repeater modules; see the preceding tables, earlier in the chapter, that show switch settings.

The following figure shows the typical locations of Clock, Repeater, and Switch modules for various node sizes. Locating the Control Computer in cabinets 0 or 1 has no effect on the location of Clock, Repeater, and Switch modules.




**C** = Clock module
**R** = Repeater module
**S** = Switch module
***** Optionally, a Port Cabinet or redundant Control Cabinet.
**†** Redundant Switch modules can be used.

**FIGURE 2-33. Clock, Repeater, and Switch Modules Location in BNS-2000 VCS Node**

## Module Installation

There are two categories of modules:

- *interface modules* — these modules, with their associated I/O boards, connect devices to the node and allow access to network services
- *Control Computer (controller) modules* — these operate the node

In a CCM system, the control complex, which can be either single or dual, consists of the CCM with onboard disk and SCSI functionality and one tape drive for a single or dual configuration. The ECPU Control Computer complex, which can be either single or dual, consists of the ECPU, SCSI/DKI, disk and tape drives.

For both of these hardware configurations on BNS-2000 VCS nodes, the critical modules are the Switch, Clock, and Repeater. In an operational node, the redundant Control Computer and Switch modules can be replaced; the Clock and Repeater modules, however, cannot be replaced while the node is operating.

When modules are inserted or removed in a node with power on, there are two requirements:

- The front panel mode switch must be set to DISABL.
- The module's I/O board must be in place.

Additional requirements apply to tape drives; see the procedures for inserting the tape drive and removing the tape drive.

The following figure illustrates the faceplates of a generic Series M1 module and a Series M2 module. For details on network services provided by interface and trunk modules and their associated I/O boards, see the *System Description.*

The figure showing the faceplate of the CCM module appears later in this chapter.

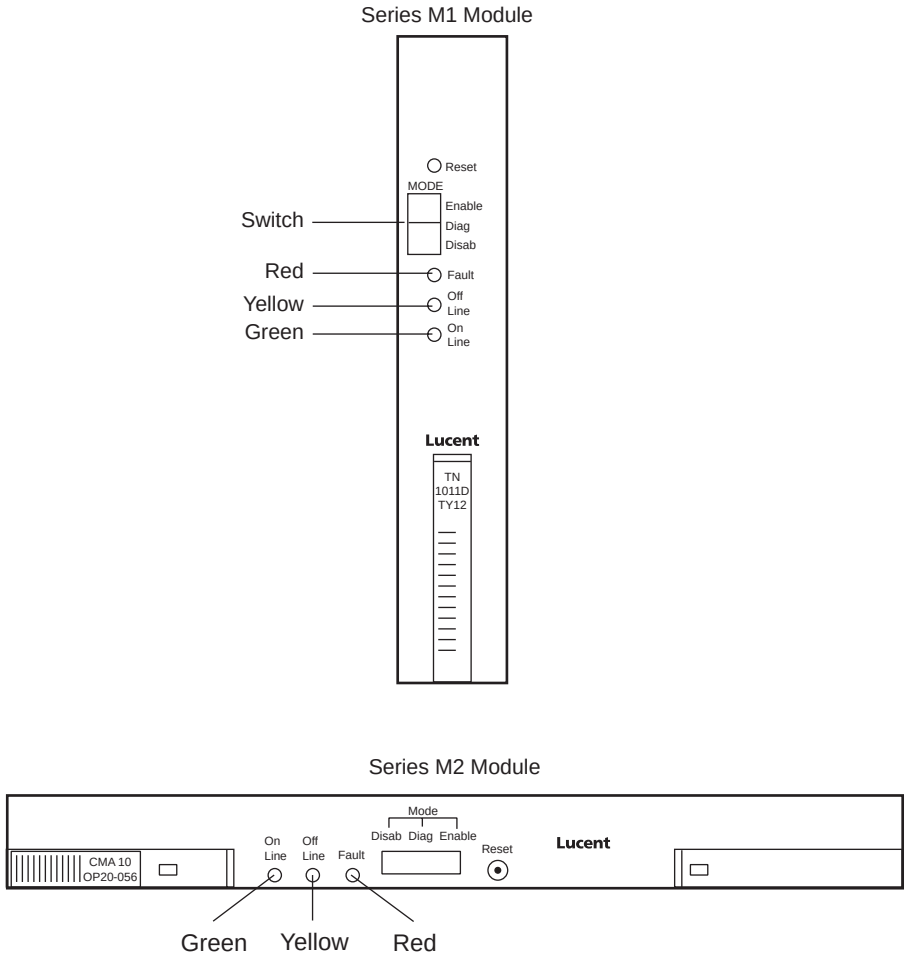



**FIGURE 2-34. Sample Series M1 and M2 Module Faceplates**

**CAUTION:** The instructions that follow assume that the node is being assembled for the first time, with the power disconnected. When the power is on, the I/O board *must* be in place when the module is inserted or removed.

In general, the modules in the front of the shelf are held in place by extraction latches. Series M2 modules have two latches and are inserted horizontally with the board's component side facing up. Series M1 modules have one latch and are inserted vertically with the latch on the bottom.

Most modules have a mode (ENABLE/DIAG/DISAB) switch. Before inserting the module, open the latch(es) and move the mode switch (if any) to DISAB. The following procedure is used to insert any module (except the tape drive; see the appropriate tape drive procedure) whether new, relocated, or returned to service.

While the critical modules are seldom removed, it is common to remove and replace interface modules in an operating node. Modules can be removed from an operating node without damage to the module. When they are removed, only the calls on that module are dropped. The module will be removed from service if it was in service before.

---

### PROCEDURE 2-25. Inserting a Module

**Application:** All modules.

1. Set the mode switch on the faceplate to DISAB.
2. With the latch extended, carefully push the module all the way into the slot until the pins on the backplane slip into the receptacle on the board.
3. Close the latch to lock the module into position. If the module does not seat easily, check for obstructions or bent pins.
4. Move the mode switch on the faceplate to the ENABLE position.

---

### PROCEDURE 2-26. Removing a Module

**Application:** All modules.

1. If the mode switch is in the ENABLE position, move it to DISAB. This will take down all calls in progress. When removing a tape drive, first remove the tape cartridge, if one is inserted.
2. Open the latch on the faceplate and pull the module straight out of the slot.

### PROCEDURE 2-27. Inserting a CCM

**Application:** All BNS-2000 and BNS-2000 VCS nodes with Series M1 Shelves.

1. Set the controller mode switch on the CCM faceplate to DISAB.

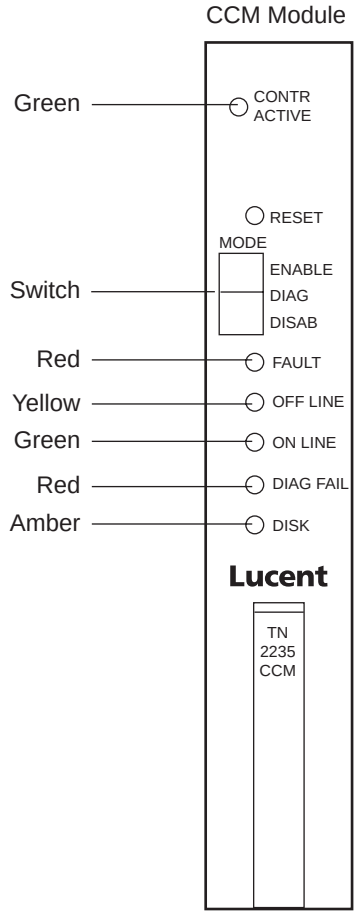



**FIGURE 2-35. CCM Faceplate**

2. With the latch extended, carefully push the module all the way into the slot until the pins on the backplane slip into the receptacle on the board.
3. Close the latch to lock the module into position. If the module does not seat easily, check for obstructions or bent pins.

**PROCEDURE 2-27. Inserting a CCM** (continued)

4. Closing the latch triggers power to the internal disk drive. Allow about five seconds for the drive to spin up. (The red LEDs go out after the drive gets up to speed.)

   In a dual Control Computer configuration:

   a. if the inserted CCM is Control Computer 1 (CC1), then there is no power reset of the MRCIO.

   b. if the inserted CCM is Control Computer 0 (CC0), then the MRCIO takes a power reset while power shifts to the CCM in Control Computer 1 (CC1). A power reset of the MRCIO causes it to cycle through its boot diagnostics before redisplaying the **MRC>** command prompt.

```
Resetting.  Please wait.
   *** MRC Loader <Number> ***
    <Copyright Notice>
      All Rights Reserved
          Built on:
* <Day Month Date hour:min:sec EST year> *
CPU TEST:      PASSED
ROM TEST:      PASSED
RAM TEST:      PASSED
TIMER TEST:    PASSED
SIO TEST:      PASSED
EEPROM TEST:   PASSED
BADADR TEST:   PASSED
*** MRC Monitor <Number> Build  ***
    <Copyright Notice>
      All Rights Reserved
          Built on:
* <Day Month Date hour:min:sec EST year> *
MRC>
```

5. Move the controller mode switch on the faceplate to the ENABLE position.

### PROCEDURE 2-28. Removing a CCM in a Dual Control Computer Configuration

**Application:** Node with dual CCMs.

1. Enter the attention sequence for the MRCIO: Escape Escape.
2. At the **MRC>** prompt, enter **dstat**.
3. If the module to be removed is the active Control Computer, perform a switchover, as follows:

```
MRC>  Escape  Escape
CC0> stop
. . .
LOADER>  Escape  Escape
MRC> switchover
. . .
CC1>
```

4. Go to MRC mode and connect the standby Control Computer.

```
CC1>  Escape  Escape
MRC> connect standby
SC>
```

5. Put the controller mode switch on the standby Control Computer (CC0>) in the DIAG position.
6. At the **SC>** prompt, enter **stop**.
7. At the **LOADER>** prompt, enter **mon**.
8. Set the controller mode switch on the faceplate to DISAB.
9. Open the latch on the faceplate about a quarter of an inch, and wait at least a minute for the internal drive to spin down.
10. Open the latch on the faceplate all of the way and pull the module straight out of the slot.

    If the removed CCM is Control Computer 1 (CC1) in a dual CCM configuration, then there is no power reset of the MRCIO.

    If the removed CCM is in Control Computer 0 (CC)), then the MRCIO takes a power reset while power shifts to the CCM in CC1. A power reset of the MRCIO causes it to cycle through its boot diagnostics before redisplaying the **MRC>** command prompt.

### PROCEDURE 2-29. Removing a CCM in a Single Control Computer Configuration

**Application:** Node With a single CCM.

1. At the **CC0>** prompt, enter the **stop** command.
2. At the **LOADER>** prompt, enter the **mon** command.
3. Set the controller mode switch on the module faceplate to the DISAB position.
4. Open the latch on the module faceplate about a quarter of an inch, and wait at least a minute for the internal disk drive to spin down.
5. Open the latch on the faceplate all the way and pull the module straight out of the slot.

---

### PROCEDURE 2-30. Inserting ECPU and SCSI/DKI Control Computer Modules

**Application:** BNS-2000 and BNS-2000 VCS Series M1 Shelves with ECPU and SCSI/DKI modules.

1. Set the controller mode switch on the module faceplate to DISAB.
2. With the latch extended, carefully push the module all the way into the slot until the pins on the backplane slip into the receptacle on the board.
3. Close the latch to lock the module into position. If the module does not seat easily, check for obstructions or bent pins.
4. Move the mode switch on the module faceplate to the ENABLE position.

---

### PROCEDURE 2-31. Removing ECPU and SCSI/DKI Control Computer Modules

**Application:** BNS-2000 and BNS-2000 VCS Series M1 Shelves with ECPU and SCSI/DKI modules.

1. Enter the attention sequence for the MRCM: Escape Escape .
2. At the **MRCM>** prompt, enter **dstat**.

**PROCEDURE 2-31. Removing ECPU and SCSI/DKI Control Computer Modules** (continued)

3. If the module to be removed is part of the active Control Computer, perform a switchover, as follows:

```
MRCM>  Escape  Escape
CC0> stop
. . .
LOADER>  Escape  Escape
MRCM> switchover
. . .
CC1>
```

4. Go to MRCM mode and connect the standby Control Computer.

```
CC1>  Escape  Escape
MRCM> connect standby
SC>
```

5. Put the controller mode switch on the standby Control Computer (CC0>) in the DIAG position.
6. At the **SC>** prompt, enter **stop**.
7. At the **LOADER>** prompt, enter **mon**.
8. Set the controller mode switch on the faceplate to DISAB.
9. Open the latch on the module faceplate and pull the module straight out of the slot.

### PROCEDURE 2-32. Inserting the Tape Drive on a CCM System

**Application:** A CCM tape drive module.

The tape drive is mounted on a circuit board with a faceplate similar to other modules.

**CAUTION:** Be careful not to bump or jar the tape drive module. Store the drive only in its shipping package, and keep it in the same environment as the node. If the drive is exposed to extreme temperature and humidity during shipping, let it stabilize in the node environment overnight before opening the package.

1. Open the latch and carefully push the module all the way into the slot until the pins on the backplane slip into the receptacle on the board.
2. Close the latch to lock the module into position and trigger power to the tape drive. If the board does not seat easily, check for obstructions or bent pins.

---

### PROCEDURE 2-33. Removing the Tape Drive on a CCM System

**Application:** A CCM tape drive module.

1. When the yellow LED is out, the tape has stopped. Once the tape has stopped, remove the tape from the tape drive.
2. Open the latch about a quarter-inch.
3. Open the latch all the way and slide the drive straight out of the slot.

### PROCEDURE 2-34. Inserting Disk and Tape Drives on an ECPU System

**Application:** ECPU tape and disk drive modules.

The disk and tape drives are mounted on circuit boards with faceplates similar to other modules.

**CAUTION:** Be careful not to bump or jar the disk drive module. Store the drives only in their shipping packages, and keep them in the same environment as the node. If the drives have been exposed to extreme temperature and humidity during shipping, let them stabilize in the node environment overnight before opening the package.

1. Open the latch and carefully push the module all the way into the slot until the pins on the backplane slip into the receptacle on the board.
2. Close the latch to lock the module into position and trigger power to the disk drive. If the board does not seat easily, check for obstructions or bent pins.

---

### PROCEDURE 2-35. Removing Disk and Tape Drives on an ECPU System

**Application:** ECPU tape and disk drive modules.

1. *For tape drives,* remove the tape before removing the drive, after the tape has stopped indicated by the red LED or yellow LED going out.
2. *For disk drives,* if the node is operational, bring the Control Computer to the **`MONITOR>`** prompt; see the **Node Administration** chapter. This idles the disk drives. The red LED on the drive faceplate should remain unlit.
3. Open the latch about a quarter-inch. Wait until a click is heard.
4. Wait at least a minute for the drive to spin down (red LED is lit).
5. Open the latch all the way and slide the drive straight out of the slot.

# Node Administrative Interface Cabling

This section explains cable routing and also describes how to configure and connect standard administrative interfaces (administrative console, system printer, and *StarKeeper* II NMS) to the node.

A wide variety of cables and adapters can be used in a network configuration:

- When cables and other components are specified, no other cables and components can be used. Otherwise, the company is not liable for failure to meet FCC regulations.
- For the node to comply with the Class A limits, at least the first 25 feet of I/O cables must be shielded. Many cable types are available in versions with or without EMI shielding.
- Due to fire code requirements, any cable that runs through a plenum must be sheathed in a fire-resistant material. Ordinary cable sheathing is not fire-resistant, and cannot be used for cables that pass through air duct or plenum locations. Refer to the *Data Networking Products Quick Reference* for information on plenum cables.

Connections between modules and end points are covered in the *Planning Guide* and the specific interface module reference documentation.

## Cable Management

The following figure shows the suggested routing of I/O cables through guides in the cable management recesses on the side of the cabinet.

#### Routing I/O Cables

Cables are dressed through the cable management area on the left, as seen from the back of the cabinet. The cable management area is the rectangular recess in the back corners of the cabinet. The cables from the next higher cabinet enter the upper opening. The cables to the next lower cabinet exit through the larger opening. The long cables from cabinet 3 to cabinet 4 pass across the bottom of cabinet 4 to the right up through the cable management area and into the upper opening of cabinet 3.

Typically, cables are routed up to racks in the CO. In a computer room with a raised floor, cables are often routed down and through the floor.

---

### PROCEDURE 2-36. Installing Cable Covers and Guides

**Application:** All nodes.

The cable guides on each cabinet snap open and closed for cable insertion. Plastic covers fit both sides of the cabinet and snap in place over the cable guides.

1. Break out both flat parts of the cover, top and bottom, leaving an L-shaped piece.

**PROCEDURE 2-36. Installing Cable Covers and Guides** (continued)

2. For the top cabinet:
   a. *If the I/O cables are routed through the floor,* leave a flat side in place to completely cover the cables.
   b. *If the cables are routed upward,* leave a flat side in place on the bottom cover.
   c. A matching metal cover is used on the Base Power Unit. This cover has no sides to break out.

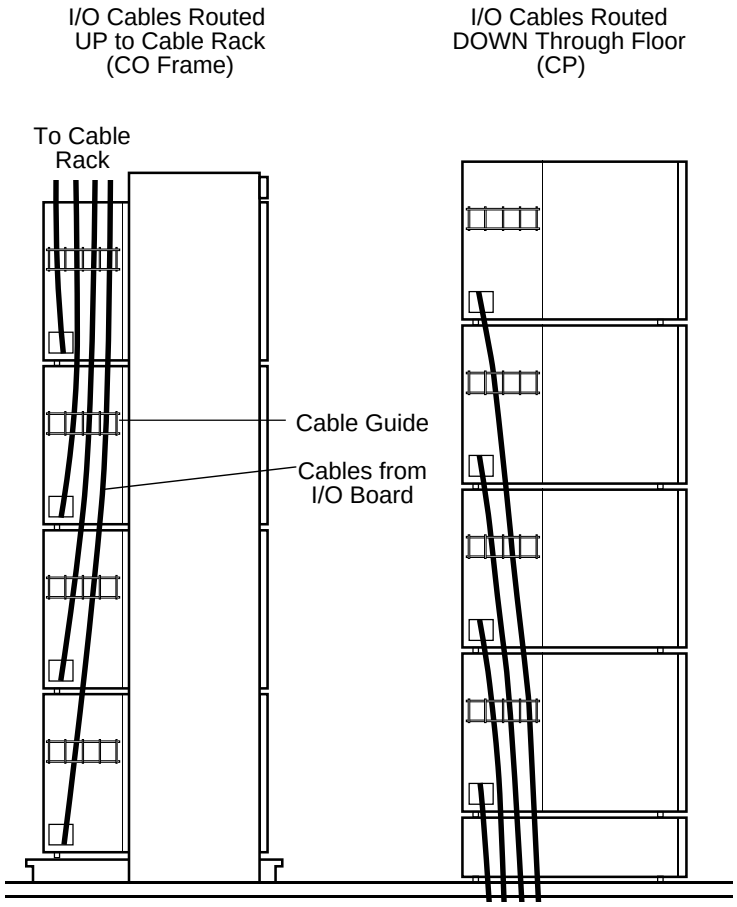



**FIGURE 2-36. I/O Cable Management Side Views**

## Administrative Interfaces

Three physical EIA ports are provided for administrative interfaces to the node: A, B, and M (if MRC is used). Typically, connections to these ports are as follows: to port A, the console and dedicated printer; to port B, *StarKeeper* II NMS (indirectly via a TY module) and an optional ARU; and to port M, a remote terminal (indirectly via TY module) or modem.

The connections are made as follows:

- The console (an asynchronous video display terminal [VDT] and keyboard), from which the administrator enters commands and receives system reports. This interface is typically connected via one of the following:
  - — to port A of the ABM cable for the CTS1 I/O board on a CCM system
  - — to port A of the AB cable for the CTS2 I/O board on a CCM system
  - — to port A of the AWJ15 I/O board on an ECPU system
  - — to port A of the AWJ16B I/O board on an ECPU system with the optional MRCM
- A printer that can be configured to receive and print out reports and automatic alarm messages sent by the Control Computer. The printer is typically connected as follows:
  - — to port A behind the console to which it is dedicated (CCM or ECPU system)
  - — to port B, if *StarKeeper* II NMS is not used, of the ABM cable for the CTS1 I/O board (CCM system with MRCIO).
  - — to port B of the AWJ15 I/O board (ECPU system without an MRCM)
  - — to port B of the AWJ16B I/O board (ECPU system with an MRCM).
- A modem, used to access the Control Computer's console ports for remote maintenance and administration. This interface is connected to the M port of the MRC.

  The interface to the M port on the MRCIO may be set to 14400 bps (this speed is not supported for ports A and B). If this rate is selected for the M port, the baud rates for ports A and B should not exceed 9600 bps to avoid lost or garbled data.

### VDT Console Connections

Any ASCII terminal that supports both an uppercase and lowercase character set can be used. All administered data is presented to the console screen and also can be directed to a printer. This console is typically connected to the node via one of the following:

- to port A of the ABM cable for the CTS1 I/O board (CCM system)
- to port A of the AB cable for the CTS2 I/O board (CCM system)
- to port A of the AWJ15 I/O board (ECPU system)
- to port A of the AWJ16B I/O board (ECPU system with the optional MRCM).

The default setting for port A (which can be changed with the **enter node** or **change node** commands) is *both* (meaning both console and printer). With the default setting, the port can be used immediately at system start-up without being configured by the network administrator.

The default baud rate for port A is *9600*, and the default for parity is *none*. These defaults are recommended to maintain access to the Control Computer when everything on the network is down and only monitor mode is available. In particular, avoid setting the port to 19200 bps; at that speed, data overruns can occur, causing garbled commands or output. All other options described in the following procedure are required. If different options are chosen for a console connected to port A of the ABM cable for the CTS1 I/O board or to port A of the AB cable for the CTS2 I/O board (CCM system); or to port A of the AWJ15 I/O board or to port A of the AWJ16B I/O board (ECPU system with the optional MRCM) monitor mode commands will not run properly.

The console terminal is connected to port A by an M25BS-MOD cable. See the following two figures for an illustration of this configuration.

---

### PROCEDURE 2-37. Connecting the Console

**Application:** CCM system console is connected via the CTS1 ABM cable or CTS2 AB cable. ECPU system console connected via the AWJ15 or AWJ16B.

**Requirements:** An M25BS-MOD cable connects the console terminal to port A.

1. Refer to the user manual for the VDT being used as the console and verify that the terminal has the full ASCII character set, both uppercase and lowercase.
2. Configure the terminal as follows:
   - baud rate = *9600 bps*
   - character set = *ASCII, 8-bit characters*
   - parity = *none* (no parity)
   - flow control = *XON/XOFF* (on)

**PROCEDURE 2-37. Connecting the Console** (continued)

3. For a CCM system, run an M25BS-MOD (ED5P055-31,G179) cable from the terminal to the A connector of the ABM cable for CTS1; or to the A connector of the AB cable for CTS2.

   For an ECPU system, run an M25BS-MOD (ED5P055-31,G179) cable from the terminal to port A, the lower connector of the AWJ15 I/O board, or to port A of the AWJ16B I/O board.

   See the appropriate figures that follow.

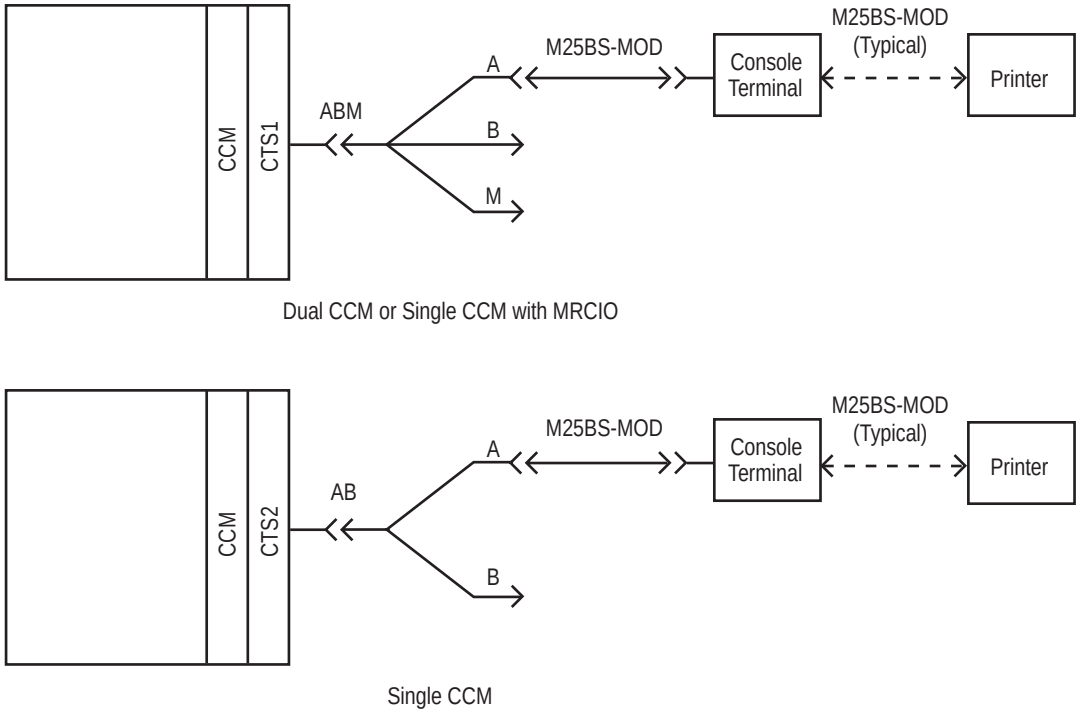



**FIGURE 2-37. CCM System Console Cabling**

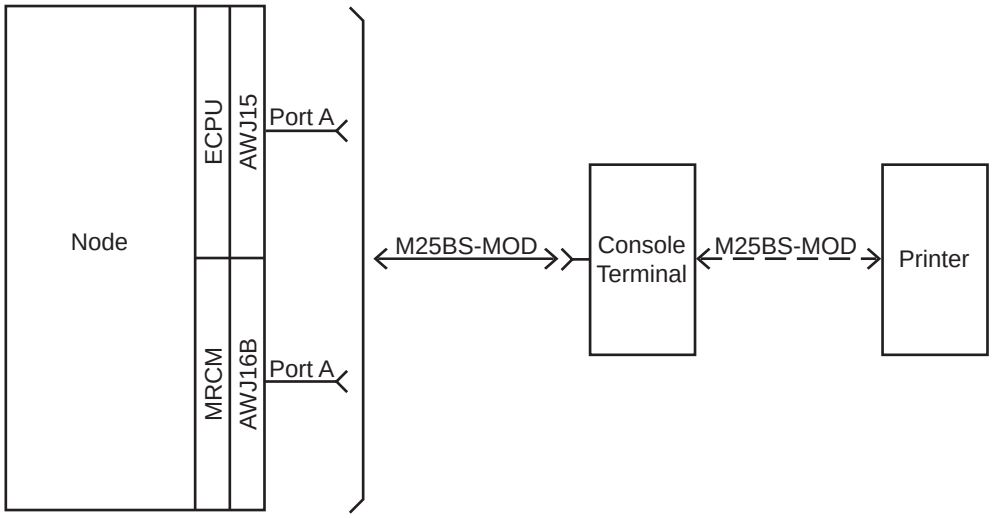



**FIGURE 2-38. ECPU System Console Cabling**

### System Printer and/or ARU Connections

The system printer is used to print out information displayed at the administration console, and can be configured to print status reports, error and alarm messages, and any other output that normally appears on the console screen. Any ASCII serial printer can be used.

**NOTE:** Reports and alarm signals contain control codes that some printers may misinterpret.

The printer is usually connected as follows:

- to port A behind the console to which it is dedicated
- to port B of the ABM cable for the CTS1 I/O board or to port B of the AB cable for the CTS2 I/O board (CCM system)
- to port B of the AWJ15 I/O board or to port B of the AWJ16B I/O board

This port can be configured as *console*, *printer*, or *both* with the **enter node** command. Either of the latter two settings is recommended. At system start-up, the default setting for this port is *none* (meaning that it is not used), so it must be configured if it is to be used. When this port does not have a device attached, it should be set to *none*. If the port is configured as a printer or console, but no device is attached, it reduces the throughput on port A. When configuring the printer use the baud rate of *9600 bps* and the default *none* for no parity.

### PROCEDURE 2-38. Cabling a Printer or ARU

1. If the application uses an ARU, the ED2P501-30,G13 cable (the Y cable included with the ARU) is used to connect both the printer and the ARU.
2. If the application does not use an ARU, the printer is connected from port B of the ABM cable on the CTS1 I/O board or port B of the AB cable on the CTS2 I/O board (CCM system) or from port B on the AWJ15 or AWJ16B I/O board (ECPU system) via an ED5P055-31,G130 cable (which is ordered separately) and an ED5P055-31,G139 D8AH-M adapter; see the following figures.

---

### PROCEDURE 2-39. Connecting a Printer to Port B

**Application:** All consoles using printer.

1. Refer to the user manual for the printer being used as the system printer and set the printer parameters to the following:
   - baud rate = *9600 bps*
   - character set = *ASCII, 8-bit characters*
   - parity = *none* (no parity)
   - flow control = *XON/XOFF* (on)
2. The system expects the printer to ignore the control characters given in the following table.

---

### TABLE 2-37. Printer Control Characters Ignored

| Hex | Octal | ASCII | Name |
|---|---|---|---|
| 0X01 | 001 | SOH | Start of Header |
| 0X19 | 031 | EM | End of Medium |
| 0X1F | 037 | US | Unit Separator |

a. If an ARU is configured, the printer must also ignore the characters given in the following table.

**TABLE 2-38. Additional Printer Control Characters Ignored When ARU Is Present**

| Hex | Octal | ASCII | Name |
|---|---|---|---|
| 0X0E | 016 | SO | Shift Out |
| 0X0F | 017 | SI | Shift In |
| 0X15 | 025 | NAK | Negative Acknowledge |
| 0X16 | 026 | SYN | Synchronous Idle |
| 0X17 | 027 | ETB | End of Transmission Block |
| 0X18 | 030 | CAN | Cancel |
| 0X19 | 031 | EM | End of Medium |
| 0X1F | 037 | US | Unit Separator |

b. If a laser printer is used, the printer connections to DTR (pin 20) and RTS (pin 4) must be interchanged using a standard null modem cable; see the following table.

**TABLE 2-39. Laser Printer Connections Through Null Modem Cable**

| Printer Pin Number | Port B Pin Number |
|---|---|
| 2 | 3 |
| 3 | 2 |
| 4 | 6 and 8 |
| 5 | 4 |
| 6 and 8 | 20 |
| 7 | 7 |
| 20 | 5 |

3. For a CCM system with an ARU, connect the printer to the node via the port B connector of the AB cable on the CTS2 I/O board or the port B of the ABM cable on the CTS1 I/O board.

   For an ECPU system with an ARU, connect the printer to the node via the port B (upper) connector on the AWJ15 I/O board or to port B on the AWJ16B I/O board as appropriate.

   To connect the printer to a node running the CCM or ECPU system that is not configured with an ARU, use an ED5P055-31,G130 cable connected to ED5P055-31,G139.

4. To connect both a printer and an ARU to a node, use an ED2P501-30,G13 cable. Do not use this cable to connect the printer only; it must also be connected to the ARU to work properly and the ARU must be turned on:
   - Connect one of the 8-pin modular connectors on the Y cable directly to the ARU and the other connector to a D8AN-M 25-pin null modem adapter (ED5P055-31, G140).
   - Connect the D8AN-M adapter to the system printer.
   - Connect the ARU to the CO alarm grid using an ED2P501-30,G8 cable.

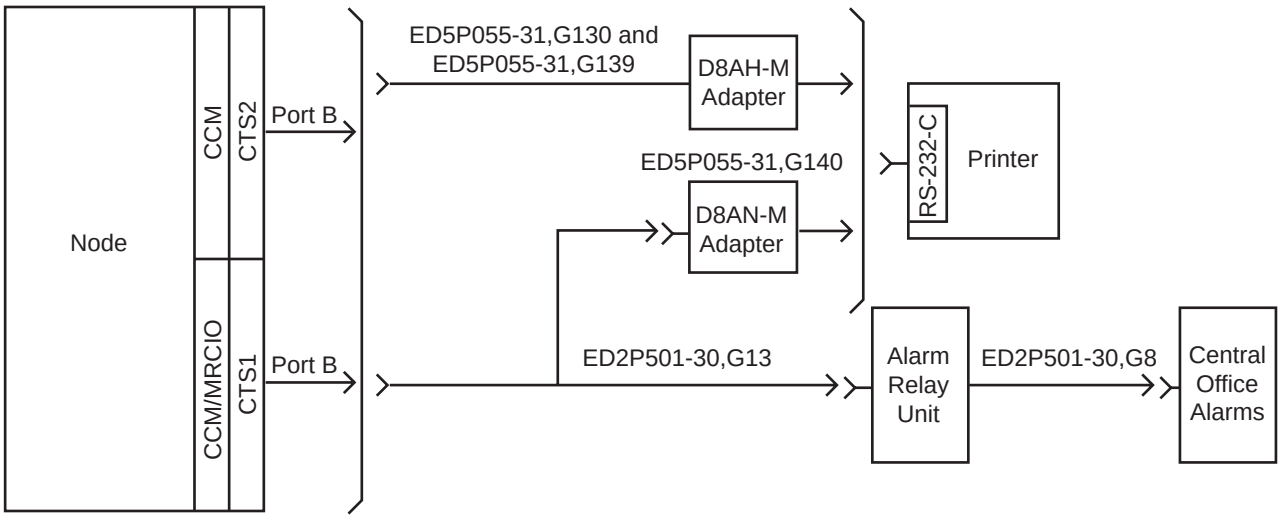



**FIGURE 2-39. CCM System Administrative Printer and ARU Cabling**

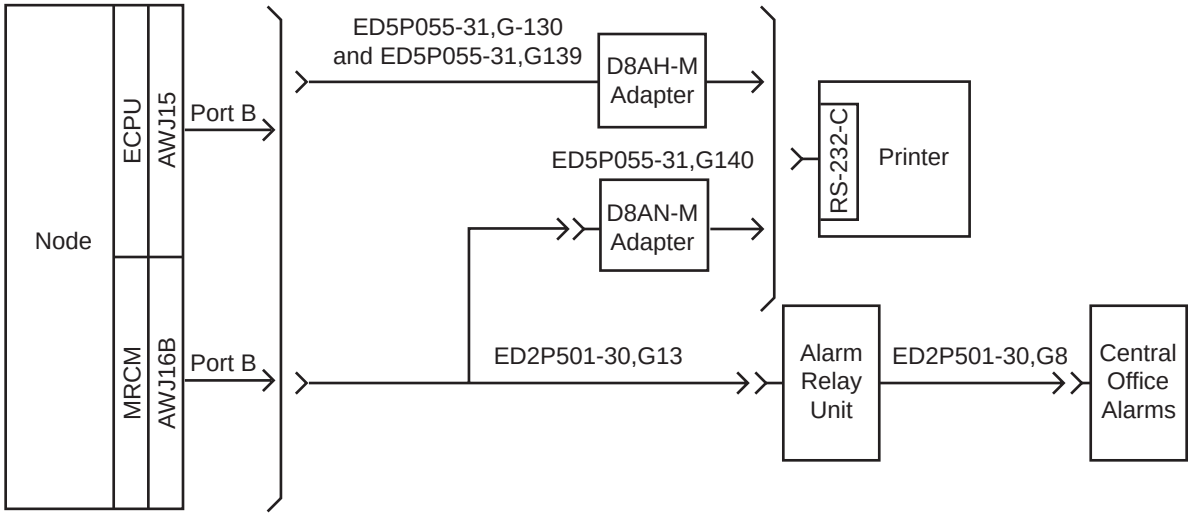



**FIGURE 2-40. ECPU System Administrative Printer and ARU Cabling**

### *StarKeeper* II NMS Connections

The following procedures describe how to connect *StarKeeper* II NMS to the node.

---

#### PROCEDURE 2-40. Cabling *StarKeeper* II NMS to the Node Via Modem

**Application:** *StarKeeper* II NMS host connected via a modem.

1. Connect one end of a 25-pin EIA cable to the B or M port of the MRC and the other end to a modem.
2. Connect another modem to the *StarKeeper* II NMS host computer's RS-232 interface.
3. Provide the modems connected to the node and to *StarKeeper* II NMS with connection to each other via appropriate switched or private line telephone network service.

---

#### PROCEDURE 2-41. Cabling *StarKeeper* II NMS to the Node Via CPM-HS

**Application:** *StarKeeper* II NMS host connected via a Computer Port Module–High Speed (CPM-HS).

Connect *StarKeeper* II NMS to the node using a Computer Port Module–High Speed (CPM-HS) connection that provides a fiber interface to the *StarKeeper* II NMS host. With this method a TY module provides a connection to port B and a CPM-HS module provides the fiber interface to the host.

This method can also be used with other nodes on the network. Trunk the other node to a node that is already connected to the *StarKeeper* II NMS host (instead of connecting it directly).

The following two figures illustrate the connections.

1. For a CCM system, connect the 25-pin end of a D8AG null-modem cable (ED5P055-31,G130) to port B of the ABM cable on the CTS1 I/O board or to port B of the AB cable on the CTS2 I/O board.

   For an ECPU system connect the 25-pin end of a D8AG null-modem cable (ED5P055-31,G130) to port B of the AWJ15 I/O board or to port B of the AWJ16B I/O board (ECPU system).
2. Plug a 258B adapter (ED5P055-31,G154) into a port on the AWJ4 (TY) I/O board.
3. Connect the modular end of the D8AG cable to one of the six receptacles of the 258B adapter.
4. Connect a FL2P-P fiber cable to a AWJ2 (CPM-HS) I/O board and to the *StarKeeper* II NMS host computer's fiber interface module.

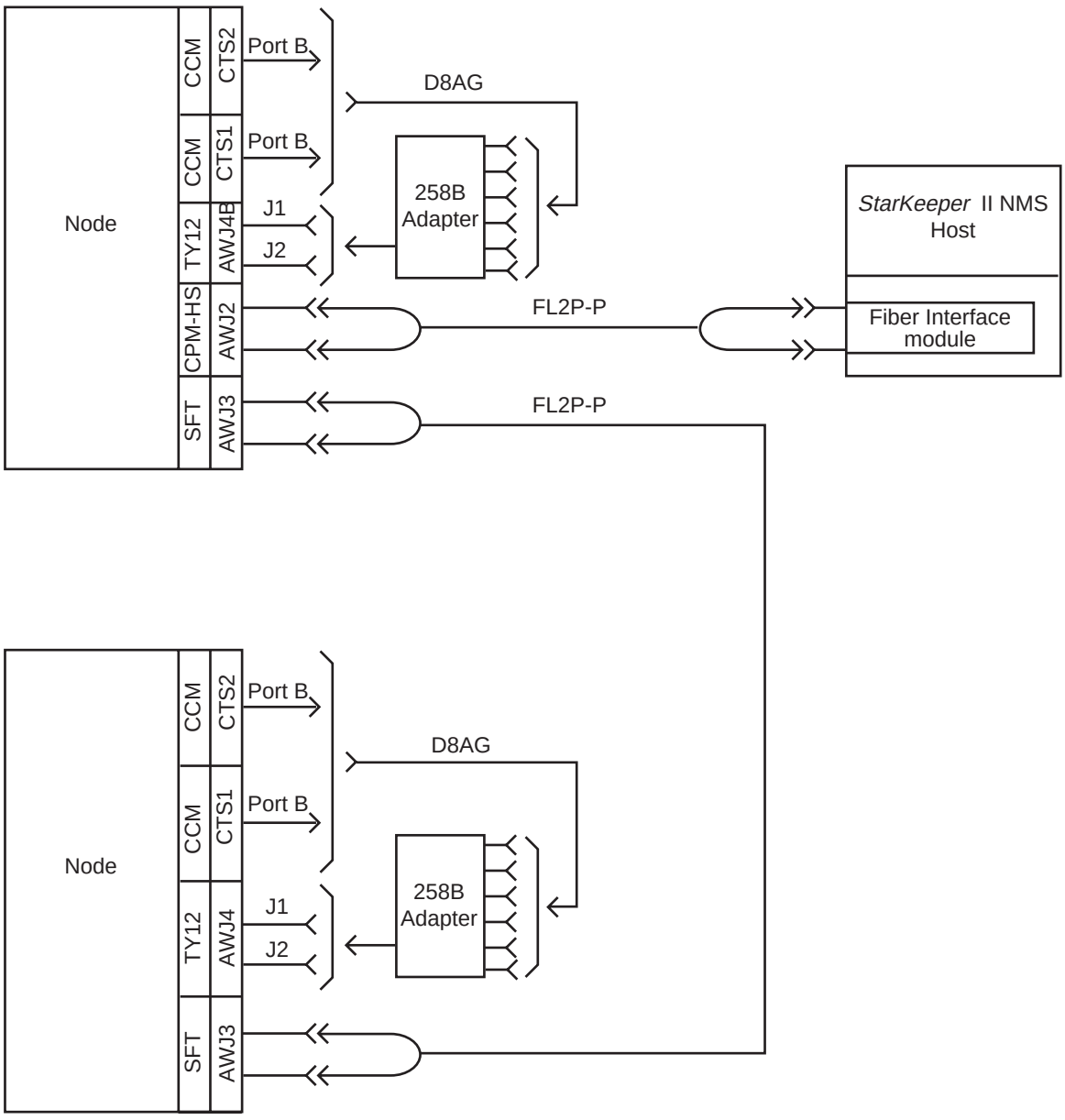



**FIGURE 2-41. Cabling a CCM System Node to a *StarKeeper* II NMS Host**

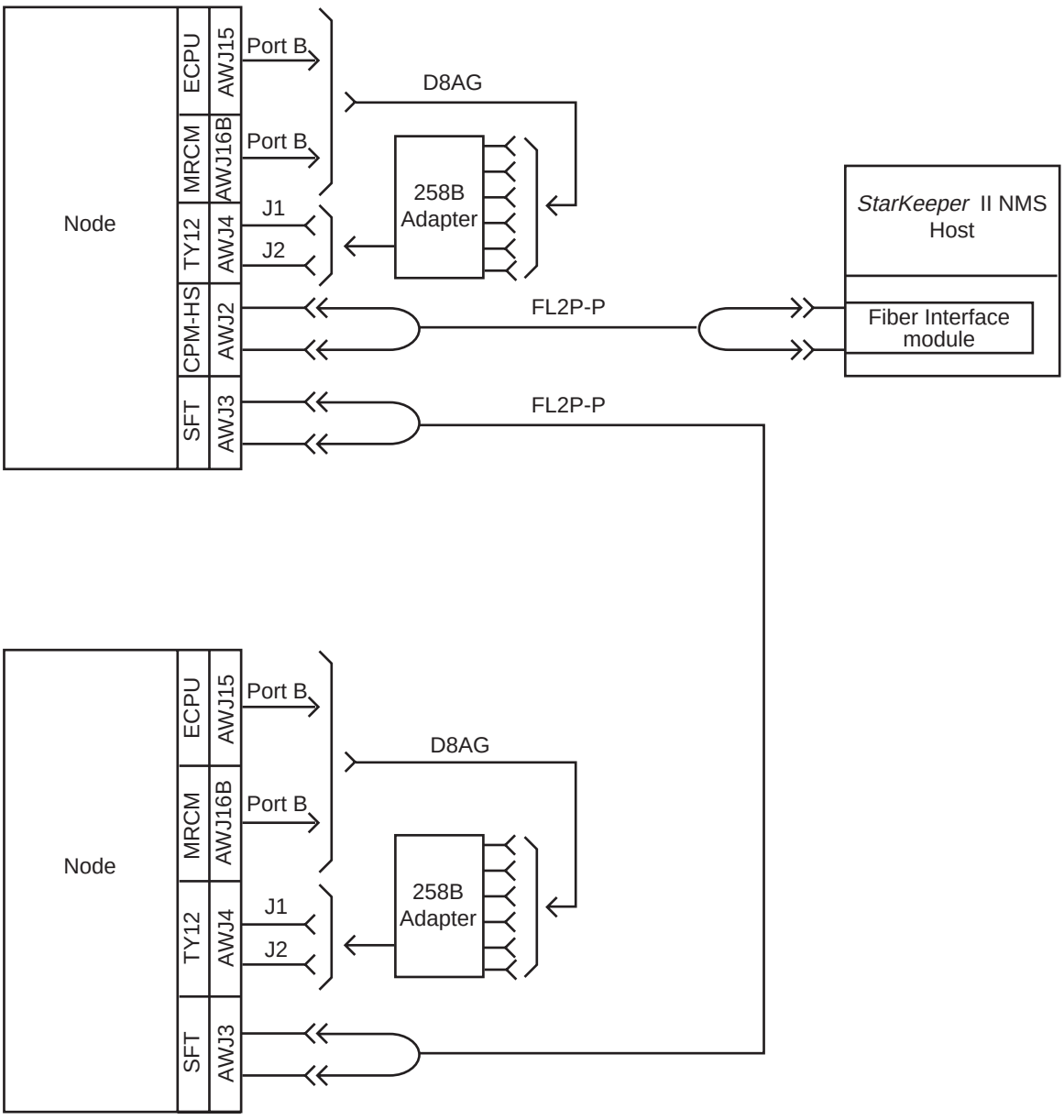



**FIGURE 2-42. Cabling an ECPU System Node to a *StarKeeper* II NMS Host**

# Node Operations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# Node Operations

The node administrator (or other personnel) must be familiar with routine procedures for operating and maintaining the system. The **Node Administration** chapter covers database configuration, node monitoring, and maintenance of database records. This chapter covers standard operations used to

- power up and power down the node
- install and start up system software
- back up and retrieve the database
- copy disk partitions and file systems
- reboot the active and standby Control Computers
- switch over to and restore the standby Switch module
- set the system time

Most of these procedures require the use of node commands. The following table summarizes the basic command sets and their associated on-screen prompts.

**TABLE 3-1. Command Sets, Modes, and Prompts**

| Set | Mode | Prompt | Comment |
|---|---|---|---|
| operations | operations | **CC0>**<br>**CC1>**<br>**SC0>**<br>**SC1>** | When the Control Computer is booted normally, the operations mode prompt appears: **CC0>** and **CC1>** indicate active Control Computers; **SC0>** and **SC1>** indicate standby Control Computers. |
| monitor | monitor | **MONITOR>** | |
| utility | utility | **UTILITY>** | There are two utility shells: *standalone* and *operations*; see *Commands Reference*. |
| loader | loader | **LOADER>** | |
| MRCM* | MRCM command | **MRCM>** | Escape Escape is the default access (attention sequence) to MRCM mode from other command modes. This command set is for MRCM-connected workstations. |
| MRCIO* | MRCIO command | **MRC>** | Escape Escape is the default access (attention sequence) to MRC mode from other command modes. This command set is for MRCIO-connected workstations. |
| * The term "MRC" is used in explanations that refer to *both* the MRCM and MRCIO command sets, modes, and functions. | | | |

### System Timeouts

Operations and MRC commands have a timeout feature. If input is not received within a specified time period, the system behaves as follows:

- *operations mode*—the console port times out if there is no input 45 seconds after the last character was typed. Press any key to return to the operations mode prompt.
- *MRC mode*—at port A or B in MRC command mode, if there is no input from the console 10 seconds after the attention sequence or 45 seconds after the last character was entered, the port reconnects to the active Control Computer. Port M has no timeout feature.

### On-line Help

The system provides on-line help for each command mode.

- *Operations commands help*—there are three levels of on-line help for the operations commands. These commands are entered at the **`CC0>`** or **`CC1>`** prompt.

  — If you enter **?** or **help**, the system supplies a screen listing all operations command verbs.

  — If you enter **help** <*command verb*> (for example, **help enter**), the system supplies a screen giving information about the verb and its objects.

  — If you enter **help** <*command verb*> <*command object*> (for example, **help enter group**), the system supplies a brief description of that verb-object combination.
- *Monitor mode help*—at the monitor mode **`MONITOR>`** prompt, if you enter **help** or **?**, a screen lists the available commands, options, and an explanation.
- *Utility mode responses*—there are no help screens for utility commands. If you enter some commands incorrectly, the system sends an informative message that should help you to re-enter them correctly.
- *Loader mode help*—to see a help screen for loader mode commands, enter **help** or **?** at the loader mode **`LOADER>`** prompt.

For more information on command sets and on-line help, see the *Commands Reference*.

# Power Up and Power Down

The procedures needed to power up the system vary according to the hardware configuration:

- a one- or two-cabinet system without a Base Power Unit
- a node with a Base Power Unit
- a CO frame

In addition, a procedure is given to shut off the power for each configuration,

---

### PROCEDURE 3-1. Powering Up a Node With No Base Power Unit

**Application:** One- or two-cabinet system with no Base Power Unit.

1. For AC modular cabinets containing 611A power supplies, check that the voltage range selection on each off-line switcher (OLS) power supply is set correctly (HIGH or LOW) for the input voltage of each modular cabinet. The switch positions are marked on the label and clearly visible when you pull out the cabinet power supply:

   208/240 VAC/350 VDC = HIGH
   120 VAC = LOW

2. For a two-cabinet system that does not have a Base Power Unit, check that both 120 VAC line cords are plugged into a 20 A (or greater) branch circuit.

   The administration console is not powered from the cabinet and requires a separate outlet.

3. Set the controller mode switch on the faceplate of the CCM or SCSI/DKI (UN635B) module:

   a. *For a single Control Computer configuration:* set the controller mode switch to DIAG.

   b. *For a dual Control Computer configuration:* on CC0, set the controller mode switch to DIAG; on CC1, set the controller mode switch to DISAB.

4. At the back of each modular cabinet, verify that one end of the AC line cord for 120 VAC (USA voltage) is plugged into the appliance receptacle on the back of the cabinet and that the other end of the cord is plugged into the branch circuit.

5. Turn on the main power switch on the AC power entry module at the back of the modular cabinet.

6. To verify that the system has power, check the front of each modular cabinet to ensure that the LEDs on the power supplies are green, and that the fans are operating.

### PROCEDURE 3-2. Powering Up a Node With a Base Power

**Application:** One- or two-stack node with a Base Power Unit.

**Switches:** CC0: DIAG; CC1: DISAB.

1. At the back of each cabinet/shelf, verify that one end of the AC line cord is connected to the Base Power Unit and the other end is connected to the AC power entry module in the shelf.
2. Verify that the line cord running from the rear of the Base Power Unit to the wall socket is plugged in and the branch circuit is on.
3. For each shelf, switch on the appropriate circuit breaker(s) on the back of the Base Power Unit: the breakers are labeled: Cabinet 0 or 4 through Cabinet 3 or 7.
4. Repeat steps 1 through 3 for the second stack.
5. At the front of each cabinet/shelf, verify that the green LEDs on the power supplies are lit and that the fans are operating.
6. After the node has been powered up, check the Control Computer cabling.
7. Use monitor mode diagnostics to verify the connections on the CCMs or on the ECPU and the SCSI/DKI modules; see the **Node Troubleshooting** chapter.

---

### PROCEDURE 3-3. Powering Up a CO Frame

**Application:** CO frame.

**Switches:** CC0: DIAG; CC1: DISAB.

1. For BNS-2000 nodes, switch on power from the power distribution panel that feeds into the terminal block at the top of the CO frame.
2. Verify that the fuses are in the top bay for each shelf. The switches are numbered 0 through 3 for the first stack of cabinets, and 4 through 7 for the second stack of cabinets.
3. At the front of each shelf, verify that the green LEDs on the power supplies are lit and that the fans are operating.
4. After the node has been powered up, check the Control Computer cabling.
5. Use monitor mode diagnostics to verify the connections on the CCMs or on the ECPU and the SCSI/DKI modules; see the **Node Troubleshooting** chapter.

### PROCEDURE 3-4. Powering Down the Node

**Switches:** CC0: DIAG; CC1: DIAG.

1. Synchronize and back up the database using the **sync** and **backup** commands.
2. *If using the MRC,* set automatic recovery off using the **set recovery off** MRC mode command first, and then return to the active Control Computer prompt using the MRC attention signal. (The following examples show **`CC0>`** as the active Control Computer prompt.)

```
CC0>  Escape  Escape
MRC> set recovery off
MRC>  Escape  Escape
CC0>
```

3. Type the following command sequence to access monitor mode.

```
CC0> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

4. *For dual Control Computers,* enter the following commands at the **`MONITOR>`** prompt.

```
MONITOR>  Escape  Escape
MRC> connect standby
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

**PROCEDURE 3-4. Powering Down the Node** (continued)

5. Follow the instructions for your configuration.

   a. *To power down a BNS-2000 VCS node without a Base Power Unit:*

      Turn *off* the main power switch on the AC power entry module at the back of each cabinet.

   b. *To power down a node with a Base Power Unit:*

      Switch *off* the circuit breaker associated with each cabinet/shelf on the rear of the Base Power Unit.

   c. *To power down shelves in a CO frame:*

      Switch *off* the power from the power distribution panel that feeds into the terminal block at the top of the CO frame or remove the fuses for the shelf at the top of each bay.

# Software Installation and Start-up Procedures

The following table gives a complete set of start-up procedures for a new node. These software installation procedures vary depending on the control complex configuration of the node:

- single Control Computer–single disk/tape drive
- dual Control Computer–dual disks/tape drive(s)

Most start-up procedures are applicable to the system *after* as well as during start-up. These procedures can be adapted as needed. Many procedures require knowledge of the care and handling of hardware and familiarity with the operations commands; refer to the **Node Installation** and **Node Maintenance** chapters in this guide, and to the *Commands Reference*.

**TABLE 3-2. BNS-2000 Software Installation Procedures Checklist**

| √ | **Single Control Computer–Single Disk/Tape Configuration** |
|---|---|
| | Procedure 3-5. Checking the Control Computer 0 Connection |
| | Procedure 3-6. Inserting a Tape into a Tape Drive |
| | Procedure 3-8. Loading Release Software to Disk 0 |
| | Procedure 3-9. Registering the Release Software |
| | Procedure 3-10. Creating the Standby File System |
| | Procedure 3-12. Verifying Control Computer 0 as Active |
| | Procedure 3-13. Loading MRC Firmware |
| | Procedure 3-16. Setting the System Time |
| √ | **Dual Control Computer, Dual Disk/Tape Configuration** |
| | Procedure 3-5. Checking the Control Computer 0 Connection |
| | Procedure 3-6. Inserting a Tape into a Tape Drive |
| | Procedure 3-8. Loading Release Software to Disk 0 |
| | Procedure 3-9. Registering the Release Software |
| | Procedure 3-10. Creating the Standby File System |
| | Procedure 3-11. Copying Release Software from Disk 0 to Disk 1 |
| | Procedure 3-12. Verifying Control Computer 0 as Active |
| | Procedure 3-13. Loading MRC Firmware |
| | Procedure 3-14. Performing a Control Computer Switchover |
| | Procedure 3-15. Starting Control Computer 1 as Standby on Disk 1 |
| | Procedure 3-16. Setting the System Time |

### TABLE 3-3. BNS-2000 VCS Software Installation Procedures Checklist

| √ | Single Control Computer–Single Disk/Tape Configuration Procedures |
|---|---|
| | Procedure 3-5. Checking the Control Computer 0 Connection |
| | Procedure 3-6. Inserting a Tape into a Tape Drive |
| | Procedure 3-8. Loading Release Software to Disk 0 |
| | Procedure 3-9. Registering the Release Software |
| | Procedure 3-10. Creating the Standby File System |
| | Procedure 3-12. Verifying Control Computer 0 as Active |
| | Procedure 3-16. Setting the System Time |
| √ | **Dual Control Computer–Dual Disk/Tape Configuration Procedures** |
| | Procedure 3-5. Checking the Control Computer 0 Connection |
| | Procedure 3-6. Inserting a Tape into a Tape Drive |
| | Procedure 3-8. Loading Release Software to Disk 0 |
| | Procedure 3-9. Registering the Release Software |
| | Procedure 3-10. Creating the Standby File System |
| | Procedure 3-11. Copying Release Software from Disk 0 to Disk 1 |
| | Procedure 3-12. Verifying Control Computer 0 as Active |
| | Procedure 3-13. Loading MRC Firmware |
| | Procedure 3-14. Performing a Control Computer Switchover |
| | Procedure 3-15. Starting Control Computer 1 as Standby on Disk 1 |
| | Procedure 3-16. Setting the System Time |

After completing the software installation and start-up procedures listed in the table, follow the procedures in the **Node Administration** chapter to configure the database.

## Checking the MRC–Console Connection

Before performing any software installation procedures for a configuration with remote maintenance and redundancy control functionality, use the following procedure to make the port A console connection to Control Computer 0 (CC0).

### PROCEDURE 3-5. Checking the Control Computer 0 Connection

**Application:** Configurations with a MRC.

**Switches:** CC0: DIAG; CC1: DISAB.

**Status:** The port A console either shows the **MONITOR>** prompt or no prompt if the MRC is not connected to Control Computer 0.

1. Enter the MRC attention signal by pressing the Escape key twice.

   ```
   MONITOR>  Escape  Escape
   MRC>
   ```

2. At the **MRC>** prompt, enter the **connect 0** command.

   When the **MONITOR>** prompt returns, the console is connected to Control Computer 0.

## Tape Procedures

Two types of tape are used, depending on your node hardware configuration: DDS tape is used with a CCM system; 40MB tape is used with an ECPU system.

The two procedures that follow describe how to insert and remove a tape. For both the CCM and ECPU system, the procedures are similar except that the DDS tape does not require formatting. Tapes should always be stored in a nonmagnetic environment with stable temperature and humidity. The **Node Maintenance** chapter includes tape handling and storage guidelines.

### PROCEDURE 3-6. Inserting a Tape into a Tape Drive

**Application:** A release tape or blank tape used for database storage (for the ECPU system, make sure the 40MB tape is formatted; see Procedure 3-24).

1. If you are inserting a release tape, make sure it is write-protected. For the CCM system, the write-protect slide should be pushed to the left and visibly open. For the ECPU system, the write-protect slide should *not* be in the RECORD position.

   If you are using a blank tape for database storage, make sure it is write-enabled. For the CCM system, the slide should be pushed to the right and visibly closed. For the ECPU system, the slide should be in the RECORD position.

**PROCEDURE 3-6. Inserting a Tape into a Tape Drive** (continued)

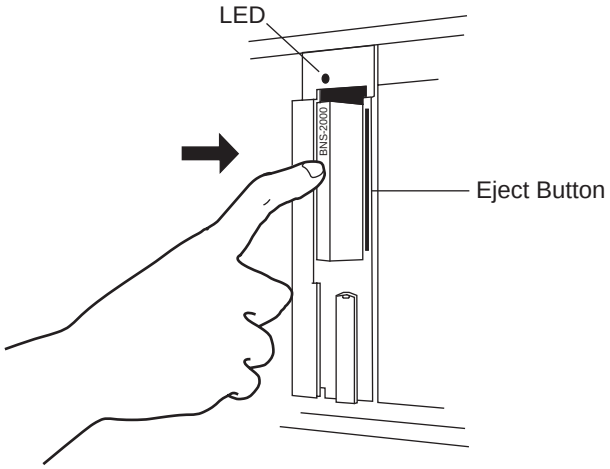


**FIGURE 3-1. BNS-2000 ECPU 40MB Tape Drive**

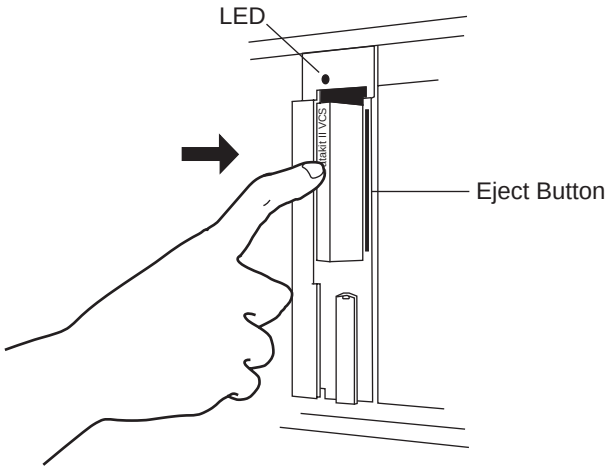


**FIGURE 3-2. BNS-2000 VCS ECPU System 40MB Tape Drive**

2. Insert the tape into the drive; the tape is designed to prevent improper insertion.

   *For the ECPU system,* see the previous figure; the write-protect slide is at the top of the cartridge.

**PROCEDURE 3-6. Inserting a Tape into a Tape Drive** (continued)

With the label facing you (on a 40MB tape, the metal base will be to the right), push the tape against the hinged flap that covers the drive opening until it snaps into place.

*For the CCM system*, see the two figures that follow. The write-protect slide is at the top of the cartridge as inserted into an internal drive and to the right of the cartridge as inserted into the external drive.

With the label facing you, push the DDS tape against the hinged flap that covers the drive opening; the tape is pulled automatically into the drive on insertion.

When the tape is properly seated, the yellow LED (CCM system) or red LED (ECPU system) on the drive will light for about 15 seconds (CCM system) or about two minutes (ECPU system). During this time, the drive is initializing.

*Wait for the LED to go out* before using the tape. Any attempt to access the tape before the initialization sequence completes will fail.

3. If the yellow or red LED does not go out and begins regular blinking, the initialization sequence has failed. The tape (or possibly the drive) may be faulty; try re-inserting the tape, or refer to the **Node Troubleshooting** chapter to fix the problem.

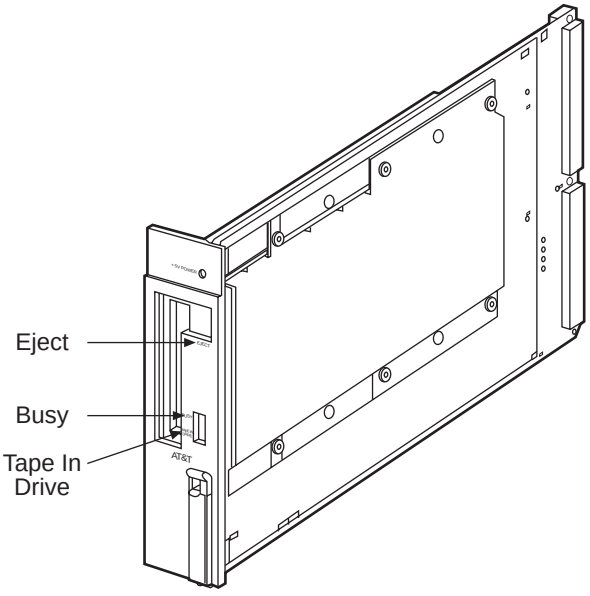


**FIGURE 3-3. CCM System Internal View of DDS Tape Drive**

**PROCEDURE 3-6. Inserting a Tape into a Tape Drive** (continued)

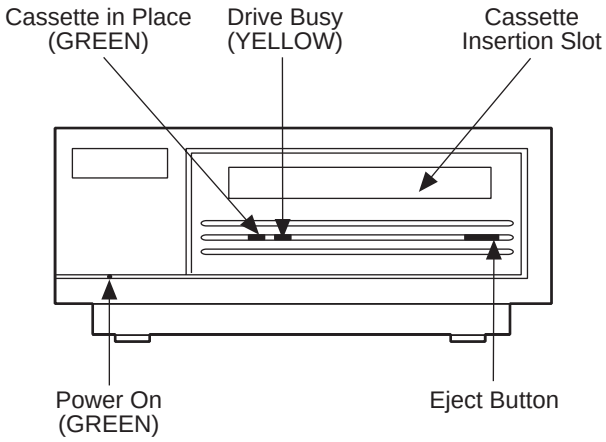


**FIGURE 3-4. CCM System External View of DDS Tape Drive**

**PROCEDURE 3-7. Removing a Tape From a Tape Drive**

**Application:** All tapes.

1. Make sure the yellow LED (CCM system) or red LED (ECPU system) on the tape drive is *off*.
2. Press the eject button on the tape drive to disengage the tape from the drive mechanism. It takes several seconds for the DDS tape to be ejected.
3. Remove the tape, verify that the label is intact, and make sure that it is write-protected (for CCM system, the write-protect slide should be pushed to the left and visibly open; for the ECPU system, the write-protect slide should *not* be in the RECORD position).
4. Return the tape to its protective case for storage.

## Installing the Release Software

The software is operational when all appropriate commands have been completed and the release software has been loaded to the hard disk(s). Use the procedures that follow to perform the these tasks:

- Copy the release software to disk 0.
- Activate the software and any feature packages.
- Add new feature packages at any time.
- Create the standby file system.
- For dual disk configurations, copy the release software from disk 0 to disk 1.

---

### PROCEDURE 3-8. Loading Release Software to Disk 0

**Application:** All configurations.

**Status:** The port A console displays the **`MONITOR>`** prompt.

1. Insert the software release tape into the single tape drive attached to the secondary SCSI bus (1) for the CCM system; and into tape drive 0 for the ECPU system. Wait for the yellow LED (CCM system) or red LED (ECPU system) to go out.
2. Enter the commands shown in the screens below.

   The first **dcc** command executes for about one minute before the **`MONITOR>`** prompt returns.

   The second **dcc** command executes for about 3 to 5 minutes (CCM system); or for about 50 to 60 minutes (ECPU system); the **`Begin verify`** message appearing about halfway through.

   As the copy and verify proceeds, the yellow LEDs (CCM system) or red LEDs (ECPU system) on the disk and on the tape drives light alternately.

**PROCEDURE 3-8. Loading Release Software to Disk 0** (continued)

*For a CCM system,* enter the following commands:

```
MONITOR> dcc st/1 p/15
Begin verify
MONITOR> dcc st/2 p/0
Begin verify
MONITOR>
```

**NOTE:** In a CCM system, standard cabling connects the tape to the secondary SCSI port, indicated by the "st" used with the **dcc** commands.

*For an ECPU system,* enter the following commands:

```
MONITOR> dcc t/4 p/15
Begin verify
MONITOR> dcc t/1 p/0
Begin verify
MONITOR>
```

**NOTE:** When a disk or tape is accessed, after a power-up or a system reset, a message similar to the following may appear after the **dcc** commands are entered:
**`sense: 70 00 06 00 00 0f 00 14 00 00 00 00 28 00 00`** .
Ignore this information.

If the disk or tape cannot be accessed, an error message,
**`Primary Tape/Disk not ready (n)`**,
appears in place of **`Begin verify`** ; refer to the *Messages Reference*.

When the **`MONITOR>`** prompt reappears after the second **dcc** command, loading the software to disk 0 is complete.

3. Remove the release tape by pressing the eject button on the tape drive to disengage the tape from the drive mechanism.
4. Return the tape to its protective case.

**PROCEDURE 3-8. Loading Release Software to Disk 0** (continued)

5. *For an ECPU system,* set up the release file system by entering the following command sequence.

   **NOTE:** This step will take about 30 minutes to complete.

```
MONITOR> boot
LOADER> run
. . .
<DBG> :c
. . .
<STARTUP> $ sh
INFO:  This file system contains compressed files.
       Run setuprel to set up the release before rebooting.

Entering the stand-alone shell

MINI-SH:  What can I do for you?
UTILITY> setuprel
. . .
The release is ready to run.  Enter the reboot command.
UTILITY>
```

### PROCEDURE 3-9. Registering the Release Software

**Application:** All configurations.

**Switches:** CC0: ENABL.

**NOTE:** Ignore the following message if it appears:

**`Incorrectly formatted data received from the Switch Module.`**

1. Obtain the software registration key from 1-800-WE-2-CARE; see the **Technical Assistance and Node Registration** preface for details.
2. If the console displays the **`CC0>`** prompt, go to step 3.

   If the port A console displays the **`MONITOR>`** prompt, enter the **boot** command to go to the **`CC0>`** prompt.
3. At the **`CC0>`** prompt, enter the **install registration** command.
4. Enter the key when prompted. The following screen appears:

```
            <Product Name> Node Registration Process

 Please call 1-800-WE2-CARE to register your <Named> product and
 obtain a software registration key which will permit you to continue
 the <Product>> installation process.  Non-USA customers should
 contact their supplier.

              Node Identifier: 83931

              Software Release Number:  3VS6.0

              Software Build Number: 35

Please provide your Node Identifier, Software Release Number, Software
Build Number, and any associated Feature Package Activation Identifiers
to the Customer Assistance Center (CAC) Specialist.

The CAC will provide you with a software registration authorization key
which you will enter at the "Please Enter Key:" prompt.

Please Enter Key: 333h-2u2-3333
```

The standard timeout applies to the **install registration** command. If you do not enter the key within 2 minutes, the message **`Timeout on Input`** appears. If this happens, re-enter the command.

If the key entered does not match the key internally generated by the release software, a message appears asking you to enter the key again. There are several possible reasons for failure of the key; see the following table.

**PROCEDURE 3-9. Registering the Release Software** (continued)

| Reason | Action | Explanation |
|---|---|---|
| Incorrect entry | Try again | The **install registration** command gives you two chances before terminating; you can always start over |
| Misunderstood key | Call 1-800-WE-2-CARE again to confirm the key | |
| Wrong serial number | Use Node Identifier number from the screen display and call 1-800-WE-2-CARE again | Number on the CCM or SCSI/DKI module label may not match the number stored in PROM |

To exit from the screen without entering a key, press Delete .

5. Press Return when prompted to confirm that the feature packages should be installed.

```
Installing the <Named> feature package.
Confirm [yes, no: +(yes)]: yes  Return
The installation of the <<named> feature package is complete.
     .
     .
     .
```

**SCREEN 3-1. Feature Package Installation Screen**

After confirmation of each feature package the following screen appears.

```
The following feature packages are installed on this node:

        - <Named Feature Package>
        - <Named Feature Package>
        - <Named Feature Package>

This node is now registered.  Please continue installation procedures.
CC0>
```

**SCREEN 3-2. Feature Package Installation Confirmation**

The system is now operational and all commands are enabled.

### PROCEDURE 3-10. Creating the Standby File System

**Application:** All configurations.

**Switches:** CC0: ENABL; CC1: DISAB.

**Timing Note:** Creating the standby file system takes about 5 minutes.

1. Go to the utility shell and then enter the **copystby** command to create the standby file system on the active disk.

```
CC0> utilsh
UTILITY> copystby
. . .
*** Creation of standby file system complete. ***
UTILITY>
```

2. When the standby file system is complete, type **exit** at the **UTILITY>** prompt to return to the **CC0>** prompt.

---

### PROCEDURE 3-11. Copying Release Software From Disk 0 to Disk 1

**Application:** Dual Control Computer configurations.

**Switches:** CC0: ENABL; CC1: DISAB.

**Requirements:** The port A console displays the **CC0>** prompt.

**Timing Note:** Disk-to-disk copying takes 5 to 10 minutes.

1. Use the following command sequence to copy the release software from disk 0 to disk 1.

```
CC0> initialize standalone
. . .
MINI-SH: What can I do for you?
UTILITY> dupdisk
. . .
UTILITY>
```

2. At the **UTILITY>** prompt, enter the **reboot** command and at the **Are you sure?** prompt, type **y**.

**NOTES:** Disk 1 now contains a copy of disk 0 including the software registration and feature packages. Control Computer 1 will use the CCM or SCSI/DKI serial number (node identifier) of Control Computer 0 (CC0). It is not necessary to repeat the software registration procedure on Control Computer 1 (CC1).

## Starting and Verifying the Active Control Computer

Use the appropriate procedure to start (boot) the active Control Computer (CC0). The booting procedure verifies that the Control Computer can boot to the operations prompt and that the SCSI buses in a dual Control Computer configuration are functioning properly.

When the system is initially brought on line, the Switch module in cabinet 0, slot A, is automatically configured and enabled as active in the database. The standby switch is configured and should be restored.

**NOTE:** Ignore the following error message if it appears while booting:
**`REPORT ERROR: config: switch and configuration data inconsistent, slot=B`**.

When the node is booted, file system checks are automatically run on the active file system. If a problem is found during these checks, it is fixed, and then the node automatically reboots.

If the node has dual Control Computers, either Control Computer can boot from either disk.

---

### PROCEDURE 3-12. Verifying Control Computer 0 as Active

**Application:** All configurations.

**Switches:** CC0: ENABL; CC1: DISAB.

**Status:** The port A console displays the **`CC0>`** prompt.

1. Enter the **dstat cc** command at the **`CC0>`** prompt. The output of the **dstat** command includes information about the Control Computer. **`Active Disk 0`** confirms that Control Computer 0 is active and has booted from disk 0.

   **NOTE:** For single Control Computer configurations, software installation is complete.

2. For dual Control Computer configurations, go to monitor mode and boot Control Computer 0 from its secondary disk.

```
CC0> stop
. . .
LOADER> monitor
. . .
MONITOR> boot s
. . .
CC0>
```

3. Enter the **dstat cc** command at the **`CC0>`** prompt. The output of the **dstat** command verifies that Control Computer 0 has booted from active disk 1.

**PROCEDURE 3-12. Verifying Control Computer 0 as Active** (continued)

4. Go to monitor mode.

```
CC0> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

5. Enter the **boot** command at the **`MONITOR>`** prompt to boot Control Computer 0 from its primary disk. When the **`CC0>`** prompt appears, Control Computer 0 is active.

## MRC Firmware

This section describes interactions with the MRCIO and the MRCM boards. To avoid using two terms, MRC is used to indicate MRCM or MRCIO, depending on which hardware is present in your node. Labels and prompts for MRCM boards are "MRCM"; and for MRCIO boards, "MRC". These boards arrive from the factory with their firmware loaded in an electrically erasable programmable read-only memory (EEPROM). Because the MRC firmware is already loaded, the release software supplied on tape might be a different version.

**NOTE:** The release versions of the software do not need to match. Check your release letter for the correct version of the MRC firmware; the letter will state if the firmware should be downloaded. If you have questions, call 1-800-WE-2-CARE.

---

**PROCEDURE 3-13. Loading MRC Firmware**

**Application:** Configurations with an MRCIO or MRCM.

**Switches:** CC0: ENABL; CC1: ENABL.

**Requirements:** Run the MRC **load** command from port M only; during execution of the command, ports A and B are disabled. Automatic recovery must be set to *off*.

**Timing Note:** The **load** command takes about 10 minutes to execute at the default baud rate of 9600 bps.

**CAUTION:** Loading (or reloading) destroys the old version of the MRC firmware and any configuration data previously entered, such as port parameters.

See the *Commands Reference* for more detailed explanations of the commands used in this procedure.

**PROCEDURE 3-13. Loading MRC Firmware** (continued)

1. Normally, port M is connected to a secure modem for remote access. To execute the **load** command, however, connect a local console to port M through a null-modem adapter; any remote console may be disconnected during the **load** sequence and must be reconnected (dialed in) after the download is complete.
2. Use the commands shown in the following screen to go to the standalone utility shell.

```
MRC> set recovery off
MRC> connect active
WARNING: Connection of port M to active controller will result in the
         disconnection of Console A from the active Control Computer.
         Continue (y/n): y
CC0> init standalone
.  .  .
MINI-SH: What can I do for you?
UTILITY>
```

3. To verify that the file containing the firmware is present, use the **cd** command to change to the proper directory and the **ls** command to list the file. The MRC firmware is in the *download* directory; the full path name of the file is */download/mrcm* for the MRCM; and *download/mrcio*, for the MRCIO.

   *For the MRCIO,* enter the following:

```
UTILITY> cd /download
UTILITY> ls mrcio
mrcio
UTILITY>
```

   *For the MRCM,* enter the following:

```
UTILITY> cd /download
UTILITY> ls mrcm
mrcm
UTILITY>
```

**PROCEDURE 3-13. Loading MRC Firmware** (continued)

4. Use the attention signal to enter MRC mode and the **load** command to load the firmware. The following screen will appear. Respond to the prompts as shown, except for the program file name.

   **NOTE:** *For the MRCM,* the following response should be typed:

   ```
   Program file name: mrcm
   ```

   *For the MRCIO,* the following response should be typed:

   ```
   Program file name: mrcio
   ```

```
UTILITY>  Escape  Escape
MRC> load
WARNING: Program file to be loaded must be in a directory on a control
computer.  Continuing load removes the current program in the MRC.
. . .
Continue (y/n): y

               MRC Loader
INFO:  0  =  CC0,  1  =  CC1,  a  =  active CC, s = standby CC
From control computer [0,1,a,s: +(s)]: a
. . .
Control Computer must be in the directory containing the MRC program file.

Use <ESC> <ESC> to toggle between the MRC monitor and control computer.
Continue (y/n): y

Program file name: [depends on MRC hardware; see NOTE above]

INFO: Load proceeding > > > > > > > > > > > > > > > > > > > > > > > > > > > > > > >
. . .
MRC>
```

The (>) symbols show the progress of the download and self-test. This takes about 10 minutes at the default rate of 9600 baud. The self-test is then repeated. The EEPROM test should pass during the second self-test; if it fails, see the **Node Troubleshooting** chapter.

5. Reconnect to the active Control Computer and reboot.

**PROCEDURE 3-13. Loading MRC Firmware** (continued)

```
MRC> connect active
WARNING: Connection of port M to active control computer will result in the
         disconnection of Console A from the active control computer.
         Continue (y/n): y
UTILITY> reboot
Are you sure? y
. . .
CC0>
```

6. Use the MRC attention signal to go back to MRC mode.
7. Reconfigure changed MRC parameters using the MRC **set** command.
8. Disconnect the port M console and put back the original configuration (this may be remote). The port A console should then display the **CC0>** prompt.
9. Reconfigure any other changed port parameters with the **enter node** or **change node** operations command.

## Starting the Standby Control Computer

To ensure that Control Computer 1 can be booted from disk 1, use the following procedures to perform a Control Computer switchover and to boot disk 1.

---

**PROCEDURE 3-14. Performing a Control Computer Switchover**

**Application:** Dual Control Computer configurations with a MRC.

**Requirements:** The database has been saved to the standby using the **backup standby** command.

**Switches:** CC0: ENABL; CC1: ENABL.

**Status:** The port A console displays the **CC0>**

1. At the **CC0>** prompt, enter Escape Escape to go the **MRC>** prompt.
2. Use the following command sequence to make the standby Control Computer active.

```
MRC>
. . .
MRC> set recovery off
```

The MRC **switchover** command transfers the former standby Control Computer to active status.

**PROCEDURE 3-14. Performing a Control Computer Switchover** (continued)

```
CC0> stop
. . .
LOADER> Escape Escape
MRC>  switchover
. . .
CC1>
```

**NOTE:** Ignore status messages such as: **`Standby booting, Active failed,`** or **`Standby failed`** . If you type the **switchover** command too quickly after the restore, you may get the following message: **`WARNING: Standby Control Computer 1 is failed. Continue switchover (y/n):`**.

Type **y** and press Return .

**`REPORT ERROR:stat: Improperly formatted info received from switch module`**.

3. Connect to the active controller.

```
MRC>  connect active
```

4. Check the status of Control Computer 0.

```
CC1> Escape Escape
MRC> connect 0
SC0>
```

The **`SC0>`** prompt indicates that Control Computer 0 is the standby Control Computer.

5. Switch control again.

**PROCEDURE 3-14. Performing a Control Computer Switchover** (continued)

```
SC0>  Escape  Escape
MRC> connect 1
CC1> stop
. . .
LOADER>  Escape  Escape
MRC> switchover
. . .
CC0>  Escape  Escape
MRC> set recovery on
```

The **CC0>** prompt indicates that the switchover was successful and Control Computer 0 is again the active Control Computer.

To ensure that Control Computer 1 can boot from disk 1, its primary disk, use the following procedure.

---

**PROCEDURE 3-15. Starting Control Computer 1 as Standby on Disk 1**

**Application:** Dual Control Computer configurations only.

**Switches:** CC0: ENABL; CC1: ENABL.

**Status:** The port A console displays the **CC0>** prompt.

1. Use the MRC attention signal, Escape Escape, to go to the **MRC>** prompt.
2. Use the MRC **connect standby** or **connect 1** command to connect to Control Computer 1.
   - If the **MONITOR>** prompt appears, go to step 4 and boot Control Computer 1 as standby.
   - If the **SC1>** prompt appears:
     a. Move the controller mode switch for Control Computer 1 to DIAG.
     b. Use the **stop** operations command and the **monitor** loader mode command to go to monitor mode before booting.
     c. Move the controller mode switch for Control Computer 1 back to ENABL.
3. Use the **boot p** monitor mode command to boot Control Computer 1 from disk 1. The **SC1>** prompt indicates that Control Computer 1 has booted as standby.

**PROCEDURE 3-15. Starting Control Computer 1 as Standby on Disk 1** (continued)

```
MONITOR> boot p
***Trying to Boot from Primary Disk***
. . .
SC1>
```

4. Verify that the standby Control Computer can also boot from disk 0:
   a. Move the controller mode switch for Control Computer 1 (CC1) to DIAG.
   b. Type the following command sequence:

```
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR> boot s
. . .
***Trying to Boot from Secondary Disk***
. . .
LOADER> run
. . .
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

   c. Move the controller mode switch for Control Computer 1 back to ENABL.
   d. Type the **boot** command at the **MONITOR>** prompt. The **SC1>** prompt returns.

### Setting the System Time

The system time should be set the first time the system is booted, after a power failure, or any time the system has been down for a prolonged period of time. In a system with dual Control Computers, the **set time** command affects the time on *both* disks when autobackup is *on*.

The node time-of-day clock is different from the system clocking function that synchronizes the transmission and reception of data. Setting node time is also different from setting MRC time, although they should be synchronized as accurately as possible.

---

**PROCEDURE 3-16. Setting the System Time**

**Application:** All nodes.

1. System time is set by entering a six-digit number in a 24-hour clock format (HHMMSS). The first two digits (HH) represent the hour, the second two represent minutes (MM), and the last two (SS) represent seconds; for example, *211109* equals 9:11:09 p.m.

   The date is set with a six-digit number (YYMMDD). The first two digits (YY) represent the year; the next two represent the month (MM), and the last two the day (DD); for example, *980130* stands for January 30, 1998.

   The system uses the current time and date as defaults in the command prompts.

   Enter the **set time** command and respond to the prompts shown in the following example.

```
CC0> set time
TIME[HHMMSS] +(200512): 211109
DATE[YYMMDD] +(960130): +
CC0>
```

2. Enter the **display time** command to verify that the system time is correct.
3. The MRC time should also be reset. At the **`CC0>`** prompt, enter Escape Escape to access the **`MRC>`** prompt, and use the **set time** command.

## Backing Up the Node Configuration Database

The database should be backed up at regular intervals, whenever significant changes occur, when major maintenance is planned, and when the database is initially created at system start-up. The configuration database can be backed up to an area on the same disk (the save area), to the secondary disk, to blank tapes (40MB tapes must be formatted), or to a *StarKeeper* II NMS host; see the **Node Overview** chapter for an explanation of the backup areas.

Label all tapes and store them carefully. When using a tape for the first time, write the date on the tape label to track the length of service. Tapes should be rotated, so that the tape containing older data is always the one being copied to. If **verify** errors are being received, use a new tape. In general, follow these guidelines:

- For daily backups to tape, discard tapes and replace after one year.
- For less frequent backups, discard tapes after two years.

---

### PROCEDURE 3-17. Backing Up the Node Configuration Database

**Application:** All nodes.

**Status:** If the node is already configured for auto backup (via the **enter node** or **change node** commands), the database is automatically backed up periodically to the standby disk.

**CAUTION:** Do not back up the database to a *release tape*, or the program files will be destroyed.

1. *For dual disk systems only*, to copy the current configuration files to a backup area on the standby disk, use the **backup standby** command.

   This option is recommended before booting the node from the standby disk or before a switchover takes place. When the system is rebooted from the standby disk, the configuration data is retrieved from the standby area.

2. *To copy database configuration files off-line* (and to return the copied files to the backup area of an active disk), choose one of the following options:

   a. To copy files to an off-line (save) area of disk 0 or disk 1, use the **backup save 0** or **backup save 1** command.

   b. *To copy files to a tape for the CCM system:* insert the tape to be used into tape drive, and use the **backup tape 1** command;

      *To copy files to a tape for the ECPU system:* insert the formatted tape to be used into tape drive 0 or 1, and use the **backup tape 0** or **backup tape 1** command.

      After backing up the database, remove the tape from the drive and label it.

   c. To upload files to a *StarKeeper* II NMS host, use the **backup host** <*address*> command.

# Retrieving the Node Configuration Database

Use the following procedure to retrieve a copy of a configuration database that has been saved and to replace the current database. The **retrieve** command copies the saved database from the specified off-line location to the backup area of the active disk. Data can be retrieved from a save area or from the tape or the host.

Retrieving a saved copy of the database is also useful when a disk fails and is replaced or reloaded.

Use the following procedure to reboot from the active disk and make the retrieved database the current database.

---

### PROCEDURE 3-18. Retrieving the Node Configuration Database

**Application:** All nodes.

To retrieve a database, choose one of the following options, depending on where the database was saved.

A. Enter the **retrieve save 0** or **retrieve save 1** command, if the database you want is in the disk save area.

B. Insert the backup tape and wait for the tape initialization to complete.

*For the CCM system:*

a. If this is the *first* retrieval from tape on a node running the CCM system, and the tape is the older 40MB tape, connect the 40MB tape drive to the node:

— for an internal DDS tape drive, replace the DDS tape and the tape drive, and plug the 40MB tape drive into the tape drive slot with the CSD9 I/O board; the red LED for a SCSI bus fault will be lit on the board.

— for an external DDS tape drive, plug the 40MB tape drive into the slot with the ASP8 I/O board and use the cable from the external tape drive to connect SCSI bus 1 on CCO to the ASP8 I/O board.

b. Enter **retrieve tape 1** command.

*For the ECPU system:* enter the **retrieve tape 0** or **retrieve tape 1** command.

C. Enter the **retrieve host** <*address*> command, where *address* is the service address of a *StarKeeper* II NMS host.

# Copying Disk Partitions and File Systems

A disk partition is an area of the disk; a file system is a series of bytes in that partition which may include all or part of the partition. Refer to the **Node Overview** chapter for a description of standard disk partitions.

*To copy a partition,* use the **dcc** command at the **MONITOR>** prompt.

*To copy a file system,* use the **diskcpvfy** command at the standalone **UTILITY>** prompt.

When file systems must be reloaded, use the following procedure.

---

### PROCEDURE 3-19. Copying Disk Partitions and File Systems

**Application:** All nodes.

**Switches:** CCO: DIAG; CC1: DIAG.

**CAUTION:** In a configuration with dual Control Computers using the MRC, remove the standby Control Computer from service and set automatic recovery to *off* to prevent copying to file systems in use by the standby Control Computer.

When you have finished copying, use the **set recovery on** MRC command to turn automatic recovery back on and **restore standby** to bring the standby Control Computer back into service.

1. First, go to monitor mode as shown in the following screen, and then use step 2 or step 3, or both, if needed.

```
CC0> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

2. To copy a partition from the specified tape to the partition on the disk, use the **dcc** <*device*> <*device*> command.

   *For the CCM system,* enter the following:

```
MONITOR> dcc st/2 p/0
```

**PROCEDURE 3-19. Copying Disk Partitions and File Systems** (continued)

*For the ECPU system,* enter the following:

```
MONITOR> dcc t/1 p/0
```

3. To copy file systems from disk to disk, go to utility mode from the **<STARTUP>$** prompt and use the **diskcpvfy** command.

```
MONITOR> boot
. . .
LOADER> run
. . .
<DBG> :c
. . .
<STARTUP>$ sh
UTILITY> diskcpvfy
> rdskp0 rdsks0
. . .
>  Control  -  D
UTILITY>
```

4. Move the controller mode switch for CC0 or CC1 to ENABL and reboot.

```
UTILITY> reboot
Are you sure? y
. . .
CC0>
```

# Rebooting the Active Control Computer

After the Control Computer has first been booted, or initialized, there are times when it is desirable or even necessary to reboot. For example, some critical alarms only clear with a reboot, and some critical modules are not properly initialized except through a reboot. The various ways that a reboot can be done are given in this section.

There are two levels of reboot. A *warm reboot* is least disruptive to service, while a *cold reboot* has the most effect on service.

## Warm Reboots

A warm reboot reinitializes the Control Computer and disrupts administration and maintenance activity. It does not disrupt data transport or disconnect calls in progress. A cold reboot reinitializes the Control Computer, resets all modules, restarts all maintenance processes, and downloads operating software to all downloadable modules. It disrupts data transport, clears and resets the switches, and disconnects all calls in progress. Switched connections have to be re-established; permanent connections are reconnected by the Control Computer.

To initiate a warm boot, choose the method that matches the initial conditions. You can reboot from the system prompt, **`CC0>`**, from the **`MONITOR>`** prompt, from the utility shell prompt, or by using the controller mode switch. The interaction required depends on whether the controller mode switch is in the ENABL position or the DIAG position. If the switch is in the ENABL position, the reboot will complete unattended. If the switch is in the DIAG position, you will have to enter some commands. The following procedures shows five ways to reboot depending on how much console control you have when the boot starts.

In a dual Control Computer configuration, with **set recovery on**, a warm reboot also performs a switchover.

---

### PROCEDURE 3-20. Performing a Warm Reboot on the Active Control Computer

**Application:** All configurations.

**Switches:** CC0: ENABL; CC1: DISAB.

**Status:** The port A console displays the **`CC0>`** prompt.

**NOTE:** For dual Control Computer configurations, disable automatic recovery before a reboot with the **set recovery off** MRC command. Enable automatic recovery when the reboot is complete.

The green LED on the Switch module is lit during a warm reboot.

After rebooting, check the system time; if it needs to be reset, use the appropriate procedure.

**PROCEDURE 3-20. Performing a Warm Reboot on the Active Control Computer** (continued)

A. This option is the preferred way to reboot; use this option if you are at the **CC0>** prompt.

1. Enter the **sync** and the **initialize controller** commands.

```
CC0> sync
. . .
CC0> initialize controller
. . .
CC0>
```

2. When the reboot process is complete, the **CC0>** prompt reappears.

B. Use this option if you need to change hardware. Make the change when the system is at the **MONITOR>** prompt, before booting.

1. Enter the command sequence shown in the screen below. The **boot** command causes a boot from the primary disk as the default.

```
CC0> sync
CC0> stop
. . .
LOADER> monitor
. . .
MONITOR> boot
. . .
CC0>
```

2. If the primary disk is not ready or does not have valid software, then the system tries to boot from the secondary disk.

   To boot from the secondary disk when both disk drives are available, enter the **boot s** command.

3. When the reboot process is complete, the **CC0>** prompt appears.

**PROCEDURE 3-20. Performing a Warm Reboot on the Active Control Computer** (continued)

C. Use this option if the console displays the **CC0>** prompt, but *not* if you are administering the node remotely.

1. Move the controller mode switch (CCM or SCSI/DKI) to DIAG.
2. Enter the following command sequence.

```
CC0> sync
CC0> stop
. . .
LOADER> run
. . .
<DBG> :c
. . .
<STARTUP> $ Return
. . .
CC0>
```

3. When the reboot process is complete, the **CC0>** prompt appears.
4. Move the controller mode switch (CCM or SCSI/DKI) back to ENABL.

**CAUTION:** The following options are less desirable way of booting; only use Options D and E when no other method works.

D. When the console is not available, this option can be used. Do *not* use this option, if you are administering the node remotely.

1. Move the controller mode switch (CCM or SCSI/DKI) module from ENABL to DIAG and press the reset button.

   Wait for the **MONITOR>** prompt to appear.
2. Move the controller mode switch (CCM or SCSI/DKI) back to ENABL.

**PROCEDURE 3-20. Performing a Warm Reboot on the Active Control Computer** (continued)

3. Enter the following command sequence.

```
MONITOR> boot
* * *  Trying to Boot From Primary Disk ***

A  RECOVERY REBOOT
   Reason:  SOFTWARE INITIATED BY ADMINISTRATOR

. . .
Booting CC0>
CC0>
```

When the reboot process is complete, the **CC0>** prompt appears.

E. This option is preferred to Option D when the console is not available. Do not use this option if you are administering the node remotely.

1. Move the controller mode switch (CCM or SCSI/DKI) from ENABL to DIAG to DISAB and then move it up to ENABL again.
2. When the reboot process is complete, the **CC0>** prompt appears.

## Cold Reboots

A cold reboot reinitializes the Control Computer, resets all modules, restarts all maintenance processes, and downloads operating software to all downloadable modules. It disrupts data transport, clears and resets the switches, and disconnects all calls in progress. Switched connections have to be re-established. Permanent connections are reconnected by the Control Computer.

A cold reboot also depends on the initial conditions. Two reboot options are provided for increasing hardware coverage, if you have control from the console. The third option involves cycling power on the node. The options for a cold reboot in the following procedure are increasingly disruptive of node service.

As a cold reboot takes place, first the yellow LED and then the green LED are lit on the Switch modules.

---

### PROCEDURE 3-21. Performing a Cold Reboot on the Active Control Computer

**Application:** All configurations.

**Switches:** CC0: ENABL; CC1: DISAB.

**Status:** The port A console displays the **`CC0>`** prompt.

**CAUTION:** In a cold reboot, *all* calls are taken down. Use a cold reboot only as a last resort.

**NOTES:** For dual Control Computer configurations, disable automatic recovery before a reboot with the **set recovery off** MRC command. Enable automatic recovery when the reboot is complete.

The green LED on the Switch module is lit during a warm reboot.

After rebooting, check the system time; if it needs to be reset, use the appropriate procedure in this chapter.

This procedure provides three options for performing a cold reboot. For dual Control Computer configurations, disable automatic recovery before a reboot with the **set recovery off** MRC command. Enable automatic recovery when the reboot is complete.

The green LED on the Switch module is lit during a warm reboot.

After rebooting, check the system time; if it needs to be reset, use the appropriate procedure in this chapter.

A. This option is preferred for a cold reboot.

1. At the **`CC0>`** prompt, enter the **sync** and **initialize circuits** commands.

   *Rebooting resets all modules.*

2. When the reboot process is complete, the **`CC0>`** prompt reappears.

**PROCEDURE 3-21. Performing a Cold Reboot on the Active Control Computer** (continued)

B. This option does a **remove** and **restore** on all modules. All existing calls are brought down and no new calls can be made until the boot completes. All downloadable modules are downloaded again.

   1. At the **`CC0>`** prompt, enter the **initialize hardware** command. When the reboot process is complete, the **`CC0>`** prompt reappears.

C. This option is recommended *only* if A or B do not work.

   1. Power down the node and power it up again; see the Power Up and Power Down section earlier in this chapter.

      When the reboot process is complete, the **`CC0>`** prompt reappears.

      After rebooting, check the system time; if it needs to be reset, use the appropriate procedure in this chapter.

## Rebooting the Standby Control Computer

In addition to rebooting the active Control Computer, the standby Control Computer must be rebooted. On a cold reboot, the standby Control Computer is included in the hardware resets. On a warm reboot, the standby Control Computer can be rebooted without disrupting the active Control Computer. The following procedure gives methods for a standby Control Computer warm reboot.

During a warm reboot, the indicators on the modules will not change because they are not reset. At most, if the database is inconsistent with the hardware and its initial state, modules will be removed from service.

During a cold boot, the indicators on the modules change to show the reset and, in some cases, test and download status. In particular, the Switch module shows cold boot state changes.

---

**PROCEDURE 3-22. Rebooting the Standby Control Computer**

**Application:** All nodes.

**Switches:** CC0: ENABL; CC1: ENABL.

**NOTE:** Remove the standby Control Computer from service any time you do not want the MRC to automatically reset the standby Control Computer (for example, during a reboot or if there is a hardware problem).

This procedure provides three options for rebooting the standby Control Computer.

**PROCEDURE 3-22. Rebooting the Standby Control Computer** (continued)

A. This option is preferred for rebooting.

1. Use the attention signal to go to the **MRC>** prompt and enter **remove standby** to remove the standby Control Computer from service.
2. Move the controller mode switch (CCM or SCSI/DKI) for the standby Control Computer to DIAG.
3. Enter **connect standby** to connect to the standby Control Computer. The **SC1>** prompt appears.

   If the **MONITOR>** prompt appears, enter **boot** to reboot to the **SC1>** prompt.
4. Enter the following command sequence.

```
SC1> stop
. . .
LOADER> run
. . .
SC1>
```

   When the reboot process is complete, the **SC1>** prompt reappears.
5. Move the controller mode switch (CCM or SCSI/DKI) for the standby Control Computer back to ENABL.
6. Go to the **MRC>** prompt and enter **restore standby** to restore the standby Control Computer to the in-service state.

B. Use this option if the standby Control Computer is not responding.

1. Go to the **MRC>** prompt and enter **remove standby** to remove the standby Control Computer from service.
2. Move the controller mode switch (CCM or SCSI/DKI) for the standby Control Computer to DIAG and press the reset button.
3. Enter the following command sequence.

```
MONITOR> boot
. . .
LOADER> run
. . .
SC1>
```

**PROCEDURE 3-22. Rebooting the Standby Control Computer** (continued)

4. When the reboot process is complete, the **SC1>** prompt reappears.
5. Move the controller mode switch (CCM or SCSI/DKI) to ENABL.
6. Go to the **MRC>** prompt and enter **restore standby** to restore the standby Control Computer to the in-service state.

C. Use this option when the console is not available.

Move the controller mode switch (CCM or SCSI/DKI) from ENABL to DIAG to DISAB, and all the way up to ENABL again.

When the reboot process is complete, the **SC1>** prompt reappears.

D. This option is used to reboot the standby Control Computer from the **MRC>** prompt. Use the **init standby** command.

# Restoring the Standby Switch

The following procedure outlines the steps to restore a standby Switch module. The **switchover switch** command is also used to switch over to the in-service standby Switch module.

---

**PROCEDURE 3-23. Restoring the Standby Switch**

**Application:** Nodes with redundant Switch modules.

1. Use the **dstat switch** command to check the slot number and status of the redundant Switch module.
2. At the **CC0>** prompt, enter the **restore switch** command.

   After the message **Standby switch <module address> is downloading** appears, the **CC0>** prompt returns. The process runs in the background for about six minutes before the following message appears.

```
<YY-MM-DD> <hh:mm:ss> NODE=<xxxxx>
8635B MODADDR=<addr> SWITCH=standby MODTYPE=switch
REPORT STATUS: swmaint: Restore standby switch successful.
```

3. Synchronize the database using the **sync** command.
4. If an error is detected on an active Switch module, automatic switchover to the in-service standby Switch module occurs. Alarm messages indicate that a switchover has occurred.

   Use the **dstat switch** command to determine the status of the standby Switch module.

# Formatting Disks and Tapes

*For the CCM system,* only disks are formatted for use.

*For the ECPU system,* disks and tapes are formatted to prepare them for use. Tapes are also reformatted to compensate for wear or because of changes in the installation parameters. Tapes may be formatted using the standby Control Computer.

Disks are formatted using the certifier on the software delivery tape. Tapes are formatted using the certifier from the disk. The general process is to stop the software from running and boot the software delivery tape, run the certifier on the device of choice, and then return to running the software.

The active Control Computer is used to run the certifier, so the software is taken out of service during the process. Attempting to use the standby Control Computer and thereby avoid taking the software out of service is *not* recommended because the active Control Computer will attempt to write to the disk being formatted.

Attempts to format the secondary disk using the standby Control Computer to run the certifier will result in format failure and SCSI bus resets.

The following procedure assumes that the system is actively running the release on the primary disk. Use the subset of steps that are applicable; for example, if the console displays the **`MONITOR>`** prompt, you can start from there.

---

### PROCEDURE 3-24. Formatting a Disk or Tape

**Application:** All configurations.

**Switches:** CC0: DIAG; CC1: DISAB.

**Status:** The port A console is connected to CC0 and displays the **`CC0>`** prompt.

**Timing note:** Formatting takes about 20 minutes for a disk and about 45 minutes for a tape.

**CAUTION:** Formatting erases all data from the target device.

Formatting a disk should be done on the active Control Computer only. Attempting to format a disk using the standby Control Computer causes the SCSI bus to reset and a format failure to occur. During the reformat, the active Control Computer attempts to write to the disk being formatted (even with *auto backup off*). When the active Control Computer fails to get a response from the stanby disk, it resets that disk's SCSI bus. The reset causes the certifier to fail.

**PROCEDURE 3-24. Formatting a Disk or Tape** (continued)

1. Synchronize the database, stop the software, and go to monitor mode.

```
CC0> sync
CC0> stop
LOADER> monitor
MONITOR>
```

2. *For formatting the disk,* verify that the write-protect slide on the software release tape is in the write-protect position.

   Insert the software release tape in tape drive 1 (CCM system) or tape drive 0 (ECPU system). Wait for the tape drive yellow LED (CCM system) or red LED (ECPU system) to go out.

3. *For formatting the disk,* boot the release tape and run the certifier.

   *For the CCM system,* enter the following:

```
MONITOR> boot st/3
. . .
LOADER> run /diag/cert
```

   *For the ECPU system,* enter the following:

```
MONITOR> boot t
. . .
LOADER> run diag/cert
```

4. *For formatting the tape,* boot the node and run the certifier.

   Use the following steps:

```
MONITOR> boot
. . .
LOADER> run diag/cert
```

**PROCEDURE 3-24. Formatting a Disk or Tape** (continued)

5. From the Hard Disk Certifier menu, verify that the selection indicates the correct default device. If not, choose **s** from the menu, and then choose the correct target device from the submenu: *primary disk, secondary disk.* If formatting tapes for the ECPU system, choose: *primary tape, or secondary tape*.

```
             ***  Hard Disk Certifier   ***
OPTIONS:

        [s]    Select default device: Secondary Tape
        [c]    Certify disk
        [d]    Display defect list
        [f]    Format device
        [q]    Quit

ENTER:  s

DEVICE OPTIONS:

         [p]     for Primary Disk
         [s]     for Secondary Disk
         [t]     for Primary Tape   <ECPU system only>
         [st]    for Secondary Tape   <ECPU system only>

ENTER:
```

6. After selecting the correct device, the main menu returns. Choose the function to be executed. For this procedure, format (*f*) is assumed.

   Enter **f**, respond to the warning prompt, and wait for the formatting to finish.

```
ENTER: f
WARNING: Format will erase Secondary Tape!!
Continue  ? [y/n]: yes

Initiating format on Secondary Tape.
Formatting
 . . .
```

7. When the main menu reappears, choose **q** to quit and return to the **MONITOR>** prompt.
8. To return to operations mode, set the CC0 switch to ENABL and enter **boot** at the **MONITOR>** prompt.
9. Remove the release tape and store it in a safe place.

### PROCEDURE 3-25. Replacing a Synchronization Unit (SU) on the STR4 Clock

1. Enter **dstat str4 high** to determine the status of the SU.
2. Put the SU to be replaced in the STANDBY position.
3. Use the **switchover str4** and the **remove str4** commands to take the SU out of service.
4. Enter **dstat switch high** to determine the status of the CTG13 module on which the SU resides.
5. Put the CTG13 module to be replaced in the STANDBY position.
6. Use the **switchover switch** and the **remove switch** commands to take the STR4 switch out of service.
7. Remove the CTG13 module from its slot in Shelf 0 and replace it with a new CTG13 module.
8. Execute the **restore switch** command to put the STR4 switch back into service.
9. Execute the **restore str4** command to put the SU back into service.
10. Run **diagnose str4** to verify the operation of the new SU.

---

### PROCEDURE 3-26. Replacing a Reference Input Board (RIB) on the STR4

1. Enter **dstat str4 high** to determine the status of the RIB.
2. Put the RIB to be replaced in the STANDBY position.
3. Use the **switchover str4** and **remove str4** commands to take the STR4 switch out of service.
4. Remove the RIB from its slot in the CNA7 and replace it with a new RIB unit.
5. Execute the **restore switch** command to put the STR4 switch (RIB) back into service.
6. Run **diagnose str4** to verify the operation of the new RIB.

---

### PROCEDURE 3-27. Putting the STR4 into Free-Running Mode

This procedures should be used when the STR4 must be put into free-running mode without generating a report alarm. A report alarm is typically generated when a failure of external or line references puts the Stratum 4 (STR4) Clock into free-running mode.

1. Regardless if the clock is in or out of service, use the **change str4** command to set the clock reference source to *none*.
2. Use the **verify str4** command to check the accuracy of your database change.

# Node Administration


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# Node Administration

This chapter provides basic information for configuring the database and performing other administrative tasks. Included are summaries of tasks related to services, hardware, software and the database, administrative access, and end user access. In addition, a list of the available command sets, a checklist of step-by-step instructions for database configuration, and information on manipulating the database, checking the file system, and monitoring the node are given.

## Node Administration Tasks

Administration of the node involves three main areas of responsibility:

- *configuring the database and adding services*—when system installation is complete, an administrator creates the database by entering information about the BNS-2000 or BNS-2000 VCS node, the BNS-2000 Series M2 and Series M1 Shelves, the interface and trunk modules, and the specific services required.
- *routine administration*—once the database is created, administration includes verifying the configuration data; making additions, changes, and deletions to the database to reflect new or rearranged components; removing objects from service or restoring them; backing up the database; checking the file system, and performing simple database maintenance.
- *monitoring the node*—while the system is running, monitoring goes on continually, and involves responding to system alarm messages and obtaining on-line reports about the system operations and connections.

These responsibilities fall into groups of tasks, summarized in the following sections.

### Service-related Tasks

General administrative tasks related to node services and features include:

- gathering preliminary information on the planned node setup; filling out and organizing database entry forms for modules and services; and routinely keeping node hardware configuration records up to date
- configuring the node by making initial database entries for connected devices, and then adding, changing, deleting, and verifying entries as required; this configuration data determines the main and additional services and end user features
- controlling the service states of all physical and logical network elements by placing them in service, or removing them from service

- maintaining the node using various on-line tools, including status and measurement reports, alarm messages, and diagnostic tests

In addition, the following general tasks may have to be performed for X.25 and X.75 services:

- configuring PAD profiles, including
  - *terminal user profile* used for outgoing calls from an asynchronous endpoint (one profile is assigned per node address)
  - *local profile* used for incoming calls to an asynchronous endpoint (one local profile is assigned per gateway/host port)
  - *remote profile* set after call establishment via X.29
- configuring an X.28 PAD identification signal
- defining and configuring closed user group (CUG) profiles
- configuring groups
- configuring the PAD address
- configuring the X.25 gateway for public data network (PDN) service
- configuring the X.25 and X.25P modules and ports
- configuring the X.75 national/international gateway map
- configuring the X.75 module and ports

Table 4-3 lists the tasks covered in this chapter; other tasks are covered in the appropriate module references, the *Session Maintenance Guide,* and *SMDS Guide*.

## Hardware-related Tasks

Hardware activities vary depending on how the system is set up. At system start-up, the administrator may have to check the physical installation before adding information about components to the database. Later, the administrator may physically install or replace components and oversee their maintenance. Some tasks require the use of software commands as well as physical manipulation of status (mode) switches on module faceplates. Tasks related to hardware include the following:

- installing new modules and changing or rearranging modules in the node shelves; see the section on Routine Database Administration and the **Node Installation** chapter
- monitoring the status and functioning of hardware components; see the section on Monitoring the Node

- booting and rebooting the node; see the **Node Operations** chapter
- performing routine hardware maintenance tasks; see the **Node Maintenance** chapter
- troubleshooting system operations; see the **Node Troubleshooting** chapter

Separate reference guides describe specific hardware and administrative procedures for the interface modules and for concentrators.

## Software- and Database-related Tasks

Tasks related to the release software and the node database include

- installing the release software; see the **Node Installation** chapter
- upgrading the release software; see the **Node Upgrades** chapter
- enabling the release software and feature packages with the software registration key; see the **Node Operations** chapter
- making entries to the node configuration database with the **enter** <*object*> and other operations commands; see the section on Configuring the Database
- backing up the configuration database to a variety of media, including the save area on the same disk as the database, the secondary disk, blank DDS tapes (CCM system) or formatted blank 40MB tapes (ECPU system), and a *StarKeeper* II NMS host, or a host computer running CommKit® software; see the **Node Operations** chapter
- labeling, dating, and storing backup tapes (separately from the release tapes); see the **Node Operations** chapter
- auditing and resizing the database—the system software allocates space to tables in the database for configuration data; however, depending on the node configuration, the installation of additional modules, and the expansion of services, the administrator may need to run the **dbresize** command; see the *Planning Guide* and *Commands Reference*.

## Administrative Access-related Tasks

Administrative access to the node involves the following tasks:

- setting up the maintenance and remote control functions and the associated workstations; see the **Node Installation** and **Node Operations** chapters
- setting up the console and printer to be used as the administrative interfaces; see the **Node Installation** chapter
- administering console security; see Step 1 in this chapter
- setting up remote terminals and printers as administrative interfaces; see Step 2 in this chapter
- setting up connections to a *StarKeeper* II NMS host; see Step 3 in this chapter

## End User Access-related Tasks

Besides making the database assignments and security arrangements, the following administrative tasks relate to terminal or end user access to node services, depending on the network configuration:

- enabling or customizing some terminal features, and allowing end users to change port parameters; see the *Terminal User Guide*.
- supplying access passwords to end users, if administered
- giving end users the service (or call) addresses for destinations they can access
- supplying instructions to end users for features that are enabled; additional instructions can be attached to the *Terminal User Guide* before distributing it
- coordinating access, identification, and service availability with administrators of other nodes for the end users who call destinations on your node

## Command Sets and Relationships

Administrative personnel use six sets of commands to administer and operate the node. These command sets govern the operating modes of the Control Computer and are named to reflect the functions performed in each mode. For example, when the Control Computer is in monitor mode, the administrator uses monitor commands to monitor the system.

The command sets are as follows:

- Start-up commands
- Operations commands
- Loader commands
- Monitor commands
- MRC commands
- Utility commands

In the sections that follow, enough information is given in the procedures to use the commands. Before configuring the database, however, study the examples of command entry and the resulting output, especially the objects of the **enter** commands, in the *Commands Reference*.

Because database information is structured hierarchically, certain commands are dependent on other commands. There are three basic rules to keep in mind:

1. For most objects, information cannot be changed before removing the object from service.
2. For most objects, information cannot be deleted before removing the object from service.
3. For certain objects, information cannot be added/deleted before adding/deleting other dependent objects.

The following table summarizes the relationships of the operations commands: **enter**, **verify**, **restore**, **change**, **delete**, and **remove**.

**TABLE 4-1. Command Relationships**

| Command Object | Command Verb | | | | | |
|---|---|---|---|---|---|---|
| | enter | verify | restore | change | delete | remove |
| address | √ | √ | √ | √ | √ | √ |
| *ai | √ | √ | √ | √ | √ | √ |
| *bdt | √ | √ | | √ | | |
| **bridge | √ | √ | √ | √ | √ | √ |
| bsc3270 (SYNC8) | √ | √ | √ | √ | √ | √ |
| comment | | √ | | | | |
| concentrator | √ | √ | √ | √ | √ | √ |
| cpm | √ | √ | √ | √ | √ | √ |
| cpmml | √ | √ | √ | √ | √ | √ |
| dkap (hsdkap) | √ | √ | √ | √ | √ | √ |
| e2a | √ | √ | √ | √ | √ | √ |
| epn | | √ | | | | |
| frm | √ | √ | √ | √ | √ | √ |
| *frm-m2 | √ | √ | √ | √ | √ | √ |
| *gar | √ | √ | √ | √ | √ | √ |
| gateway | √ | √ | | √ | √ | |
| group | √ | √ | | √ | √ | |
| host | | √ | √ | | | √ |
| logoff | √ | √ | | √ | √ | |
| lpm | √ | √ | √ | √ | √ | √ |
| module | | √ | | | | |
| msm | √ | √ | √ | √ | √ | √ |
| node | √ | √ | | √ | | |

* BNS-2000 nodes only.

** BNS-2000 VCS nodes only.

| Command Object | Command Verb | | | | | |
|---|---|---|---|---|---|---|
| | enter | verify | restore | change | delete | remove |
| oosmods | | √ | | | | |
| oosports | | √ | | | | |
| profile | √ | √ | | √ | √ | |
| registration | | √ | | | | |
| sam | √ | √ | √ | √ | √ | √ |
| samml | √ | √ | √ | √ | √ | √ |
| samtrk | | | √ | | | √ |
| schedule | | √ | | | | |
| sdlc8 | √ | √ | √ | √ | √ | √ |
| *shelf | √ | √ | √ | √ | √ | √ |
| slm | √ | √ | √ | √ | √ | √ |
| sphaddr | √ | √ | | √ | | |
| *ssm4 | √ | √ | √ | √ | √ | √ |
| **standby | | | √ | | | √ |
| *str4 | √ | √ | √ | √ | √ | √ |
| switch | | | √ | | | √ |
| *threshold | √ | √ | | √ | √ | |
| *trace | | √ | | | | |
| trunk | √ | √ | √ | √ | √ | √ |
| tsm8 | √ | √ | √ | √ | √ | √ |
| tsmt1 | √ | √ | √ | √ | √ | √ |
| ty | √ | √ | √ | √ | √ | √ |
| x25 | √ | √ | √ | √ | √ | √ |
| x25p | √ | √ | √ | √ | √ | √ |
| x28sig | √ | √ | | √ | √ | |
| x75 | √ | √ | √ | √ | √ | √ |

* BNS-2000 nodes only.

** BNS-2000 VCS nodes only.

The node supports pattern matching when using certain administrative commands. This feature, like shell pattern matching in the UNIX operating system, is useful for specifying selection criteria in searches, or when the exact characters that identify a group, host, or service address are unknown.

The valid pattern matching characters (wild cards) are shown in the following table.

**TABLE 4-2. Pattern Matching for Administrative Commands**

| Wildcard | Explanation | Examples |
|---|---|---|
| **?** | match any single character | **?** matches: *a, b...z* and *0, 1...9*<br>**a?z** matches: *a0z, a1z...a9z* and *aaz, abz...azz* |
| ***** | match a string of characters (any length) | ***** matches: everything in the database<br>**a*** matches: *a, aa, ar, agr1, agrp, agroup, alphagrp...*<br>**ag*** matches: *ag, agr1, agrp, agroup...* |
| **!** | match any single character except those that follow (used only when specifying originating group security and trunk call screening with the **enter address** and **enter profile** commands) | **!bz** matches: any pattern except those with the letters *bz* |
| **[*string*]** | match the string of one or more characters contained within the brackets | **a[rg]** matches: *ar, agr1, agrp, agroup...*<br>**a[rg]p** matches: *arp, argp, agroup...* |
| **[*x*-*x*]** | match for a range of characters contained within the brackets | **a[a-z]** matches: *aa, aab...azzzzzz...*<br>**a[0-9]p** matches: *a0p, a01p...a99999p...* |

The pattern to be matched cannot be longer than 72 characters. The wild card patterns can include combinations and/or repetitions of the wild cards and strings shown in the table. For example:

**[gG][rR][0-9]** matches: *gr1, Gr2, GR9...*

# Configuring the Database

This section provides the initial steps required to configure the node database and make connections to *StarKeeper* II NMS; refer to the *StarKeeper II NMS Core System Guide* for instructions on administering a node through the NMS.

If you are configuring a node database locally, this section also gives start-to-finish instructions for entering information on node components and services.

The following checklist gives the steps and procedures to configure the database.

**TABLE 4-3. Configuring the Database Checklist**

| √ | Steps and Procedures |
|---|---|
| | Step 1. Identifying the Node |
| | *Procedure 4-1. Identifying the Node and Its Administrative Interfaces* |
| | *Procedure 4-2. Administering Passwords for Console Security* |
| | *Procedure 4-3. Changing or Deleting a Password* |
| | Step 2. Adding a Remote Interface |
| | *Procedure 4-4. Adding Remote Administrative Interfaces* |
| | Step 3. Adding *StarKeeper* II NMS Connections |
| | *Procedure 4-5. Administering Node Connections to StarKeeper II NMS* |
| **NOTE: See *StarKeeper* II NMS documentation to configure the database, or continue with Step 4.** | |
| | Step 4. Adding Directory Assistance |
| | *Procedure 4-6. Enabling Directory Assistance and Governing Its Use* |
| | *Procedure 4-7. Handling Directory Entries for Two-way PCs* |
| | Step 5. Adding Billing |
| | *Procedure 4-8. Enabling the Billing Feature* |
| | Step 6. Building Profiles |
| | Step 6a. Entering Profiles for X.25 and X.75 Services |
| | Step 6b. Entering Screening Profiles for CPMs and Trunks |
| | Step 7. Entering Groups |
| | Step 7a. Adding the *select* Security Group |
| | Step 7b. Entering Group Types |
| | Step 7c. Specifying Round Robin Service |
| | Step 7d. Administering Trunk Groups and Routing |
| | Step 7e. Administering Default Routing |
| | Step 8. Entering an X.28 PAD Identification Signal |
| | Step 9. Entering a Gateway |

**TABLE 4-3. Configuring the Database Checklist** (continued)

| √ | Steps and Procedures |
|---|---|
| | Step 10. Entering Service Addresses |
| | Step 11. Adding Interface and Trunk Modules |
| | Step 11a. Configuring Features for Interface and Trunk Modules |
| | Step 11b. Configuring the GAR Module (BNS-2000 nodes only) |
| | Step 11c. Defining PDDs |
| | *Procedure 4-9. Establishing a Predefined Destination (PDD)* |
| | Step 12. Verifying the Database |
| | Step 13. Restoring Hardware to Service |
| | Step 14. Restoring Addresses to Service |
| | Step 15. Storing Configuration Data |
| | Step 16. Backing Up the Database |
| | *Procedure 3-17. Backing Up the Node Configuration Database* |

## Creating Basic Configuration Data

After completing the software installation tasks, the administrator performs the following basic configuration steps, which have network-wide effects:

- *identifies the node to the database*—by specifying its characteristics, including the service address that *StarKeeper* II NMS will use to communicate with the node
- *designates console security*—by assigning passwords
- *identifies the shelf types for BNS-2000 nodes*—by specifying the series and shelf numbers for Series M2 Extension Shelves and Series M1 Port Shelves
- *reboots the node*—this records the initial values entered in the database
- *sets the system time*

### Node Identification

When the node is booted, use the **enter node** command to define node characteristics, including console security, in the database. The **enter node** command should be the *first* command used to configure the database.

### Console Security

The console security feature allows an administrator to configure passwords for port A and port B. The password is administered with the **enter node** command after the node has been booted. Once console security is enabled, a **`PASSWORD`** prompt will appear.

### Shelf Identification for BNS-2000 Nodes

For BNS-2000 nodes only, the characteristics of Series M2 Extension and Series M1 Port Shelves are defined with the **enter shelf** command. Shelves must be identified in the database *before* modules residing in them are entered.

### Rebooting

After using the **enter node** command to specify node characteristics to the database, reboot the node with the **initialize controller** command to allow all the values set to take effect. When the reboot is complete, reset the MRC automatic recovery to *on*, if applicable.

### Setting System Time

The system time must be set the first time the system is brought up during installation, after a power failure, or when the node has been down for any prolonged period. Although a clock setting that is one hour or even one year off will not adversely affect system functioning, it makes keeping records confusing.

In a dual Control Computer configuration, the system time is updated on both disks.

The system time can be set or reset using *StarKeeper* II NMS or the procedures in the **Node Operations** chapter.

## Entering Service Data

Most services are set up for the node using a combination of **enter node**, **enter shelf** (BNS-2000 only), **enter group**, **enter address**, and **enter** <*object*> (for example, **cpm**, **frm**, or **ty**) commands. The command entries include setting module and port parameter options; associating hardware components with groups; and associating originating, receiving, and two-way groups with service addresses.

When the Stratum 4 Clock, (the SSM4 or the CMC3 I/O board) is used as a timing source for SMDS in BNS-2000 nodes, it must be entered with the **enter ssm4** or **change ssm4** commands. When the Stratum 4 Clock (the STR4 or the CNA7 I/O board) is used as a timing source for SMDS in BNS-2000 nodes, it must be entered with the **enter str4** or **change str4** commands. Parameters entered with the **ssm4** command should match the parameters set by the switches on the I/O board; see the **Node Installation** chapter.

Other services require additional **enter** commands; for example, trunk call screening security requires the entry of profiles with the **enter profile** command.

Each **enter** command has a corresponding **change** command; the **copy module** and **move module** commands may also be helpful.

As service data is entered, use the **verify** commands to check that the information recorded in the database is correct.

## Organizing Database Entry

When creating a database with the **enter** commands, follow a predetermined order for data entry. This order is partially governed by system requirements; for example, **enter node** should be the first command entered into the database and some commands are dependent on others (these are noted as appropriate). Otherwise, database entry can be tailored to the needs of your node.

The database can be configured for

- *the entire node*—before putting any component in service
- *part of the node services*—which can then be put into service before configuring another part; this strategy allows database configuration to continue during node operations

  For example, all multiplexed hosts can be added first, followed by asynchronous services; this allows asynchronous terminals on the local node to access local hosts. Or, asynchronous devices that will communicate with devices on another node can be added first, followed by the trunks to that node.
- *modules*—before installing them physically; if expansions are planned, it may save time to administer the database for the new components and associated services before installation

Plan the steps for your node, fill out all required database entry records from the interface module reference guides and the **Appendix** in this guide, and then assemble them in the order you plan to enter data.

## Backing Up Data Entered

At system start-up, when the database is created or before installing a new software release, at least one backup copy should be made. When a large database is being configured, back up the database periodically as substantial data is added; see the **Node Operations** chapter for procedures. Backing up ensures that data will not have to be re-entered manually should the database become corrupt.

## Step 1. Identifying the Node

Before doing any other administration, use the **enter node** command to identify the local node being administered. Procedure 4-1 describes how to identify the node and its administrative interfaces. Procedure 4-2 explains how to configure console security for the administrative interfaces.

Port A should be directly connected to a console for these reasons:

- until the node is booted and port B is configured, the MSMs and TYs will not work and port B is disabled
- if the node is booted and port A is connected to an MSM or TY module, the administrative port will be lost if the system fails

When the remote maintenance and control functions are used, administrative interfaces are connected to ports A and B of the MRCIO (CCM system) or MRCM (ECPU system), not the Control Computer.

---

### PROCEDURE 4-1. Identifying the Node and Its Administrative Interfaces

**Application:** All nodes.

**Switches:** CC0: ENABL or DIAG.

1. Identify the node to the database using the **enter node** command.
2. This command will prompt for a series of parameters, including:
   - the local network, area, and exchange mnemonic addresses to be associated with the node; all devices connected to the node will take their network-, area-, and exchange-level addresses from the addresses specified here. The *Planning Guide* describes address formats.

     The **enter node** command automatically creates a special group, known as *?lcl*; assigns the local network, area, and exchange addresses specified to the *?lcl* group; and puts these addresses in service. This establishes the basic and special group setup for network calls. When a set of database elements for a service is entered and put into service, calls can be sent and received on the node.
   - a directory entry for the local network, area, and exchange addresses

**PROCEDURE 4-1. Identifying the Node and Its Administrative Interfaces** (continued)

- the node's unique name, which is used in all the reports; this node name is never used by end users as a service address
- the national country code, a 3-digit number that identifies the country where the node is located
- a broadcast message (message of the day); this message will be sent to all end users when they first turn on their terminals
- Control Computer configuration; the node is automatically configured for a single, active Control Computer and an active Switch module (shelf 0)

  Various parameters identify a redundant Control Computer, dual disk drives (ECPU), a redundant Switch module, an MRCIO or MRCM, and automatic backup of disks.
- if the node is being monitored by *StarKeeper* II NMS, enter **yes** at the appropriate prompt

  Procedure 4-5 describes how to identify the service address of the node and associate it with the special group *?skimiep* that allows machine-to-machine communications between the NMS and the node.

  For BNS-2000 nodes only, another special group *?nmsiep* allows machine-to-machine communications for ICI SMDS and for the software download feature.
- how ports A and B will be used. Each port can be configured for *console*, *printer*, *both* (console and printer), or *nothing*. Enter *both* for port A, and set port B to *nothing* if no device is attached. Indicate if either port is connected to an ARU (called *aau* for alarm activator unit, in the software) and the baud rates for the port.
- a password for ports A and B, and its expiration interval. If there is no password currently configured, the **enter node** command will not prompt for port password administration unless the node has been booted with the Control Computer mode switch set to DIAG. Each port can be separately administered for the console security feature, if desired; follow Procedure 4-2 to administer the console passwords.
- how the node will handle *babbling ports*. A babbling port sends a signal of 25 consecutive off-hook packets, with no data transmitted, to the Control Computer. A hardware or software problem in an interface module or connected equipment can cause a babbling port. If many babbling ports occur at once, the Control Computer can become overloaded and the call connection rate reduced.

  A parameter of the **enter node** command allows the administrator to activate a signal that sends a message to the console when a port is babbling and allows the automatic removal of babbling ports from service.
- how the node will handle internodal trunk errors. A parameter of the **enter node** command specifies that a trunk with errors will automatically be removed from service. Another parameter specifies the number of error packets before the trunk is removed.

**PROCEDURE 4-1. Identifying the Node and Its Administrative Interfaces** (continued)

- whether to activate the extended routing feature. A parameter of the **enter node** command enables the routing algorithm for the node to handle trunk failures in ring and mesh networks.
- What the maximum hop count per call should be to prevent a call setup attempt from looping endlessly under failure conditions, and to limit the number of nodes a call setup request can cross before it is rejected.
- What the maximum CLNS hop count should be to prevent a PDU from looping endlessly under failure conditions and to limit the number of trunks a PDU can traverse before it is discarded and alarmed.
- if small window size is set for the node; *window size* refers to the number of characters a port can transmit across the backplane before a receiving port returns an acknowledgment.

  If the network contains an AIM module administered as *adu* or *other* in BNS-2000 VCS nodes, small window size will protect against data loss during transmission. Window size is especially important if your node is interworking with an ISN node likely to include AIM versions other than the MF-AIM. Setting small window size degrades node performance by a factor of 2 since it requires more packets per data transported.
- if you want to set session maintenance fine-tuning parameters; this feature is managed from *StarKeeper* II NMS and details on configuration are given in the *Session Maintenance Guide*.

3. For BNS-2000 nodes only, identify the node shelf types; use **enter shelf**.

   When the **SHELF TYPE** is identified as *m2*, the ECC I/O board is automatically entered into the database.

   When the **SHELF TYPE** is identified as *m1*, the CIM and corresponding CTRM are entered into the database.

4. Reboot the node; use the **sync** and then the **initialize controller** commands.

   This reboot is required for the passwords, the port parameters, and the appearance of the node name to take effect.

5. To check that the node was configured as intended, use **verify node** and, for BNS-2000 nodes, use **verify shelf**.

6. To reconfigure any parameters, use the **change node** and, for BNS-2000 nodes, the **change shelf** command.

### PROCEDURE 4-2. Administering Passwords for Console Security

**Application:** All nodes without passwords administered for port A or B.

**Switches:** CC0: DIAG.

1. Use the **enter node** or **change node** command to enter a password and an expiration interval for port A, port B, or both.

   A port password of six to eight characters must contain at least two alphabetic characters and at least one character that is numeric or special.

```
PORT A PASSWORD [6 to 8 characters, none: +(none)]:
RE-ENTER PASSWORD:
PORT A EXPIRATION INTERVAL (DAYS) [1-365, none: +(none)]:
PORT B PASSWORD [6 to 8 CHARACTERS, none: +(none)]:
RE-ENTER PASSWORD:
PORT B EXPIRATION INTERVAL (DAYS) [1-365, none: +(none)]:
```

2. Use the **verify node** command to confirm that the password(s) are enabled. The expiration intervals will be displayed, but the passwords will not yet be in effect.
3. Set the mode switch on the Control Computer faceplate to ENABL.
4. Execute **init controller** to make the password(s) effective.

   When console security is enabled, a **PASSWORD** prompt appears on the password-protected port when the node is rebooted, the **exit** command is entered, or the data terminal ready (DTR) signal is toggled.

   To gain access to the **CC0>** prompt, the password must now be entered.

### PROCEDURE 4-3. Changing or Deleting a Password

**Application:** All nodes with passwords administered for port A or port B.

**Switches:** CC0: ENABL.

1. Use the **change node** command to change or delete a password and an expiration interval for port A, port B, or both.

```
PORT A PASSWORD [change, delete, retain: +(retain)]: change
CURRENT PORT A PASSWORD:
NEW PORT A PASSWORD:
RE-ENTER PASSWORD:
PORT A EXPIRATION INTERVAL (DAYS) [1-365, none: +(1)]:
PORT B PASSWORD [change, delete, retain: +(retain)]: change
CURRENT PORT B PASSWORD:
NEW PORT B PASSWORD:
RE-ENTER PASSWORD:
PORT B EXPIRATION INTERVAL (DAYS) [1-365, none: +(1)]:
```

2. Use the **verify node** command to confirm that the changed password(s) are enabled. The expiration intervals will be displayed and the changed passwords will be in effect.
3. To gain access to the **CC0>** prompt, enter the new password at the password prompt.

For further details on how to handle lost passwords, see the **enter node** and **change node** commands in the *Commands Reference*.

## Step 2. Adding a Remote Interface

If the node will have a remote interface for local administration instead of, or in addition to, one directly connected, follow Procedure 4-4.

If you are planning remote administration of multiple co-located nodes, the console should be connected to a port on an asynchronous module installed in a node other than the one being administered. For example, the console for nodeA can be connected through a TY on nodeB. This connection requires a physical connection via an RS-232-C cable from port B to a TY port, with pin 8 strapped high.

Keep an extra terminal handy for direct connection. If the disk gets damaged, port A will work in monitor and utility modes at 9600 baud, but port B and the asynchronous modules may not work.

---

### PROCEDURE 4-4. Adding Remote Administrative Interfaces

**Application:** For indirect console connections through asynchronous ports.

1. Use the **enter group** command to create a receiving group to administer the node.

**PROCEDURE 4-4. Adding Remote Administrative Interfaces** (continued)

2. Use the **enter group** command to create an originating group called, for example, *admin*:
   a. assign a password to the group
   b. specify that the password is used during *select.*

      The *select* group's permissions can be obtained through the **select** command, if the correct password is known.

3. Assign a service address to the receiving group; for example, *nodeA.* When prompted for originating group security pattern, specify *admin*. Administering originating group security patterns restricts general access to the node.
4. Add information about the asynchronous module and port that connects the administrative interface to the node. For example, to configure the asynchronous TY module, use the **enter ty** command.

   This command will prompt for a series of parameters, including:

   **`SERVICE TYPE.`** Enter **console**.

   **`PARITY.`** Enter **off**.

   **`FLOW CONTROL.`** Enter **xon**.

   **`BAUD RATE.`** Enter **9600** (the default for port A).

   Operating the Control Computer ports A or B at 19200 baud can cause loss of data and garbled output on an ECPU system.
5. Use **verify ty** to check that the interfaces were administered correctly.
6. To access the console, enter the network attention signal to gain the terminal (end) user command mode; then enter the **select** command, and choose the *admin* group. Enter the correct password.

   Now, the service address *nodeA* can be entered in response to the **`DESTINATION:`** prompt, and accessed.

   ```
   DESTINATION: nodeA
   ```

   If a password is configured for the console port, the **`PORT PASSWORD:`** prompt appears next. After the correct password is entered, the **`CC0>`** or **`CC1>`** prompt appears.

## Step 3. Adding *StarKeeper* II NMS Connections

Several connections are established between the node and *StarKeeper* II NMS. The physical connection options are described in the *StarKeeper II NMS Core System Guide*; administration information is found in the *StarKeeper II NMS Graphics System Guide*.

For BNS-2000 nodes, the connection classes are the **`NM Server`**, **`Console`**, **`Administration`**, **`Performance`**, **`Billing`**, **`MRC`**, and **`Dial Backup`**. For BNS-2000 VCS nodes, the connection classes are the **`Console`**, **`Administration`**, **`Performance`**, **`Billing`**, **`MRC`**, and **`Dial Backup`**. The **`Console`**, **`MRC`**, and **`Dial Backup`** connections require no special node administration. The **`Billing`** connection is covered in Step 5 and in the *StarKeeper II NMS Core System Guide*.

Special groups are used to establish the other connections between the node and *StarKeeper* II NMS. Service addresses must be entered into the node database to allow *StarKeeper* II NMS to transfer administration and performance data (**`NM Server`**), and to download system software. Separate service addresses for administration and performance data connections must be associated with the group *?skimiep*.

For BNS-2000 nodes only, SMDS-ICI data is also transferred. A service address must be associated with the group *?nmsiep* for SMDS-ICI data transfers and for software downloads.

Other special groups are created by the node along with these, but do not require any addresses to be associated with them. All the special groups except *billing* begin with the character *?* and cannot be deleted from the node database.

---

### PROCEDURE 4-5. Administering Node Connections to *StarKeeper* II NMS

**Application:** Nodes monitored by *StarKeeper* II NMS.

1. Use the **enter address** command to enter the service address(es) for the node that *StarKeeper* II NMS will call.
2. Assign the service address(es) to the appropriate special group.
3. Administer security for the address(es), as appropriate.

If *StarKeeper* II NMS is managing your node, from this point the creation of the database is usually done from the NMS. If you need to create the database or manipulate database entities directly from a local node, continue with the following steps. Be sure to synchronize the local database with *StarKeeper* II NMS; refer to Step 15.

## Step 4. Adding Directory Assistance

To make directory assistance available to end users on the network, it must be enabled. Then, when service addresses are added to the database (Step 10), a directory listing can be created for each address.

If security is critical to your network, however, enabling directory assistance may not be desirable. The following procedure explains the relation between Steps 4 and 10, and also describes how to govern access to the directory listings.

### PROCEDURE 4-6. Enabling Directory Assistance and Governing Its Use

1. Enter the special service address *?* in the database using the **enter address** command. This one-time entry of the *?* address creates the potential for a list.

   When the **`MNEMONIC ADDRESS`** prompt appears, enter **?**. When the **`INITIAL SERVICE STATE [in, out: +(out)]`** prompt appears, enter **in**.

   As devices in the network are put into service, they will have access to the directory assistance feature. If the default (*out*) is specified, use the **restore address local ?** command to activate the feature. To create listings for the directory, continue with the next step in this procedure.

   Usually the node administrator associates service addresses with previously administered groups. A group associated with directory assistance, however, is automatically set up in the background when the **enter address** command is used to add the *?* address. Similarly, the administrator does not have to explicitly associate hardware components with the *?* group or service address.

2. When each service address for destinations on the network is configured, with separate iterations of the **enter address** command (refer to Step 10. Entering Service Addresses), perform the following steps:

   a. Create a directory entry for the address (optional). The response to the **`DIRECTORY ENTRY`** prompt determines what will appear on the directory assistance screen about this service address. Enter up to 30 characters, to describe the physical location or type of device; for example, *"printer in salesdept"*. When an entry is made, both the destination address and the entry appear in a directory listing. If no entry is made, no listing will appear for that address. If the address is a shortened, speedcall version of a longer dial string address, the following prompt will appear:

   ```
   DISPLAY DIAL STRING AS DIRECTORY ASSISTANCE [yes, no: +(no)]
   ```

   If **yes** is specified, the longer address will be displayed as the directory entry.

**PROCEDURE 4-6. Enabling Directory Assistance and Governing Its Use** (continued)

b. Govern access to the directory listing. When the **enter address** is used and a directory listing is created for an address, the **ORIGINATING GROUP SECURITY PATTERN** and **CLOSED USER GROUP PROFILE ID** prompts appear. Responding to these prompts controls access to the destination address, and also to the directory listing. Only members of groups with access to the destination have access to the directory entry.

c. Put the address immediately into service. The response to the following prompt determines if the address being entered (and its directory entry) is in service.

```
INITIAL SERVICE STATE [in, out: +(out)]
```

When **in** is entered, the address is placed into service and the directory assistance entry becomes available.

You can enter **out** and then later use **restore address** <*variable*> to put the address into service and make the directory entry available.

### PROCEDURE 4-7. Handling Directory Entries for Two-way PCs

**Application:** A network with many PCs, each associated with a different two-way group.

The *Planning Guide* describes the special case of a network with many PCs in two-way groups. This procedure shows a way to limit the number of directory entries (configured in Step 10), and should also be considered when using CUG security.

1. Create group names associated with hardware having access to a PC, with the **enter group** command. Choose names that have a standard prefix, like *dev1, dev2, dev3.* Later use the standard prefix for an originating group security pattern that governs access to a mock destination's directory entry (step 3, below).
2. When creating service addresses for PC groups, choose a mnemonic address with a standard prefix plus meaningful variation; for example, *pc4329, pc5600,* where the variations are users' phone extensions.

   At the **`DIRECTORY ENTRY`** prompt, enter **none**. End users at devices with access to *pc4329* or *pc6500* will not see an entry for it when they request directory assistance.
3. Create an additional mnemonic address for a mock destination, such as *pcxxxx,* and allow all groups that have access to any PC access to it. When entering this address with the **enter address** command, the **`ORIGINATING GROUP SECURITY PATTERN`** prompt appears.

   Referring to the example in step 1, above, you can enter **dev*** for the names that are similar; the * stands for any variation of *dev* (*dev1*, *dev2*, and so forth).

   When prompted for **`DIRECTORY ENTRY,`** enter a comment like *4001 is the user's extension.* When an end user at a device associated with group *dev1*, *dev2*, or *dev3* requests directory assistance, the screen will display the following entry:

```
pc4001      4001 is the user's extension.
```

## Step 5. Adding Billing

When the special service address *billing* is added to the database, an authorized terminal, printer, or host can obtain billing information for all ports configured for billing. Entering the *billing* address is only one part of the action necessary to provide the billing feature; the following procedure explains the details.

---

### PROCEDURE 4-8. Enabling the Billing Feature

**Application:** CPMs, CPMMLs, FRM, FRM-M2 MSM, SAM, TSM8, TSM-T1, TY, X.25, and X.25P ports. For BNS-2000 VCS nodes, extended billing is not supported for interworked ISN nodes.

1. Use the **enter address** command, and at the **`MNEMONIC ADDRESS`** prompt, enter **billing**.

   This adds the special service address *billing* to the database. There is no administered group associated with the *billing* address because the system automatically sets up a billing group

**PROCEDURE 4-8. Enabling the Billing Feature** (continued)

in the background. One-time entry of the *billing* address creates the potential for a device to collect billing information across the node, for all relevant billing-enabled ports.

a. If the node is part of a multinode exchange, and a console or printer on another node will collect the billing data, that node must be given a unique exchange alias to properly direct the call from the host or printer.

b. If the data will be collected by *StarKeeper* II NMS, connections between the node and the NMS must have been enabled using the **enter address** command; see Procedure 4-5.

c. Restore the *billing* service address to service by entering **restore address local billing**.

   This step can be done now, or after the following step when all ports for which billing information is to be collected are configured.

   Unlike other service addresses, the *billing* special address cannot be placed in service with the **enter address** command.

d. Later, as each relevant port is entered into the database (Step 11), configure the port for the billing feature by entering **on** when prompted.

```
CO> enter ty <port>
. . .
CONNECT-TIME BILLING [on, off: +(off)]: on
```

   If the node is rebooted with the **initialize controller** command, or the node reboots for any other reason, the billing port drops its virtual circuit connection. For a printer, a PDD to *billing* is recommended, because the call will be re-established after the reboot; see Procedure 4-9.

## Step 6. Building Profiles

The system uses profiles to store information for associated services such as X.3 profiles, CUG profiles, and call screening profiles.

### Step 6a. Entering Profiles for X.25 and X.75 Services

X.3 and CUG profiles are associated with X.25 host, X.25/X.75 gateway, and public data network (PDN) services. If your node uses X.25 and X.75 services, then you will need to enter the appropriate profiles; see the *X.25 and X.25P Module Reference* and the *X.75 Module Reference* for details. The **enter profile** command is used to configure profiles.

A set of standard X.3 profiles are delivered with the system and do not require any administration; see **verify profile** in the *Commands Reference* for an illustration of these profiles:

- *simple profile*—the default profile
- *transparent profile*—for file transfer between terminal and host
- *mbit profile*—needed to invoke the M-bit procedure

CUG profiles are also associated with international CUGs for communication with packet switched public data network (PDNs), and have additional applications as well.

### Step 6b. Entering Screening Profiles for CPMs and Trunks

The call screening profile is associated with CPMs and internodal trunks. A typical use might be in a shared network, where traffic from some nodes is allowed to go only to certain destinations.

Any trunk or CPM can be associated with a call screening security profile, which specifies destinations each call is allowed to reach.

A call screening profile contains a set of security patterns. Each pattern resembles an originating group security pattern, and the processing is similar. The difference is that this pattern screens access by destination rather than by origin. The security patterns specify allowed or forbidden destinations for calls. If a call destination matches an allowed pattern, and it does not match a forbidden pattern, the call is allowed to go to its destination.

Use the **enter profile** command to enter each call screening profile. Specify an identifier for each profile; refer to these identifiers, later, in the **enter cpm** and **enter trunk** commands for devices that have call screening security.

If a call screening profile has a large set of security patterns, the time required to screen calls can have a significant effect on call setup time. For efficiency, enter the forbidden destination patterns first (those beginning with an *!*, exclamation point), followed by allowed destination patterns.

If trunk call screening is used for destinations with X.121 addresses, and the destination consists of an international X.121 address (in which the network terminal number (NTN) is less than 10 digits), only the DNIC portion of the destination address is screened. The security pattern for such addresses should consist of up to 16 characters for the DNIC portion, as follows:

*DNIC portion*/*/*/* or *DNIC portion*///

## Step 7. Entering Groups

All interface and trunk modules are associated with groups; some components are not. For BNS-2000 nodes, the critical modules, the ECPU or Control Computer complex modules, and the GAR module are NOT associated with groups. For BNS-2000 VCS nodes, the Clock, Switch, Repeater(s), ECPU or the Control Computer complex are NOT associated with groups.

Consult the *Planning Guide* for more information on how groups are associated with addresses and modules, and the addressing conventions suggested for them.

### 7a. Adding the *select* Security Group

First specify an access password for an entire group, and then assign a member of an originating group, configured with **enter group**, to a special security group *select.* An end user with the permissions of the originating group can enter the password of the *select* group and acquire its access permissions.

Assigning select group permission is only one aspect of administering node security. Coordinate entry of the *select* group with the other commands that provide security.

### 7b. Entering Group Types

When interface and trunk modules and ports (Step 11) are configured, associate them with a group previously administered in the database. This group may also be associated with a service address (Step 10). The *Commands Reference* supplies detailed examples of the **enter group** command syntax for each group type (local originating, local receiving, local two-way, trunk); refer to Step 7d.

Remember, the **enter group** command can determine a network access password and its use for groups that can originate calls.

This command also governs the use of host autobaud, which is available for asynchronous (TY, SAM, AIM) connections to hosts. Host autobaud is defined for receiving groups on a group (not port) basis. For host autobaud to work, the host must have the appropriate software to support it.

Host autobaud works as follows: the system sets the receiving port speed to match that of the originating port. A series of one or more specific characters generated by the originating port allows the device connected to the receiving port to determine the speed. The particular character(s) depends on the operating system. For example, the UNIX operating system requires a Break signal.

If host autobaud is enabled for a group of TY ports with the **enter group** command, when the ports themselves are entered with the **enter ty** command, a baud rate prompt still appears. If the call is from a source (such as a CPM) with indeterminate speed, the system uses the value entered as the default port speed.

### 7c. Specifying Round Robin Service

When entering receiving, two-way, or trunk groups, round robin service can be specified with the **enter group** command. Round robin service is a method of cycling through modules or ports specified in a single group. This service tracks the identity of the last port allocated to a call. When the next call setup request comes in, the search for a free port begins with the module/port following the last one used. This hunting method reduces the chance that a user is repeatedly connected to an operative port with attached inoperative equipment.

1. Specify round robin as follows:

   a. *per_port*—this search applies to all supported interface modules that have physical/virtual ports. For BNS-2000 VCS, groups of AIM ports must be administered for round robin. Round robin service is optional for groups of TYs.

   b. *per_module*—this search applies to multiplexed interfaces like trunks, and is a method of traffic distribution; it alternately allocates calls over two or more trunks, and does not balance the traffic or the active channels over the trunks.

2. Or specify *none* in response to prompts for round robin service, and a call setup search will default to *first listed, first called*.

   In this search sequence, calls are directed to the first member of a group, regardless of the module/port that handled the last call. If the first member is busy, the search goes to the second member, and so on.

### 7d. Administering Trunk Groups and Routing

When administering trunk groups for alternate routing, keep in mind the following determinants of route sequence:

- the order in which trunk groups are listed when the **enter address** command is used
- if round robin service is specified (Step 7c) with the **enter group** command
- the order in which trunks are assigned to groups

Related features are the extended routing and hop count, set earlier (Step 1), and default routing.

### 7e. Administering Default Routing

Before administering the default routing feature for trunks, the network must be planned to use this feature. Separate the network into hub and leaf nodes at their respective levels. For example, a certain node must be designated as a *hub* node; then a set of other nodes, designated *leaf* nodes, must be given default addresses to direct all unknown addresses to the hub node via a trunk group. There can be more than one hub node at a network level, but this feature will be less effective as the number of hub nodes increases. The *Planning Guide* explains the default routing feature in more detail.

1. Administer default routing, using the **enter address** command, by entering a default address for each leaf node at each level: *_local*, *_exch* (exchange), *_area*, and *_net* (network).

   Refer to the order for entering default routing addresses below.

2. For the default addresses *_exch*, *_area*, and *_net*, enter the trunk group names of the leaf node to direct calls to the appropriate hub node.

3. For the default address *_local*, enter a trunk group to reach a remote service, or a local group to reach a local service.

4. Enter the security pattern to match the potential destination called.

   An unadministered address for a PDD, download server, or speedcall dial string will be accepted and input error warning messages will be suppressed if the appropriate level default address is available.

This feature operates in a hierarchical fashion: the *_local*, *_exch*, and *_area* hub nodes are leaf nodes for the next level. The area and exchange hub nodes must contain the names of their leaf nodes and the default names pointing to their respective hubs. A hub node only has an upper level default address defined.

Default routing addresses are entered in the following order:

1. *for the network hub node:*

   Enter all area hub node (network-level leaf nodes) names within the network collection.

2. *for the area hub nodes* (network-level leaf nodes):

   Enter all exchange hub names (area-level leaf nodes) within the network collection.

   Enter the default, *_net*, at the network address level.

3. *for the exchange hub nodes* (area-level leaf nodes):

   Enter all exchange leaf node names within the local area.

   Enter the defaults, *_area* and *_net*, at the respective area and network levels.

   Enter optional service names located at local nodes.

4. *for the local node* (exchange-level leaf node):

   Enter all local service names within the node.

   Enter the defaults, *_exch*, *_area*, and *_net*, at the respective exchange, area, and network levels.

   Enter the default, *_local*, to reach optional services on or off the local node.

5. For the default addresses *_exch*, *_area*, and *_net*, enter the trunk group names of the leaf node to direct calls to the appropriate hub node.

6. For the default address *_local*, enter a trunk group to reach a remote service, or a local group to reach a local service.

7. Enter the security pattern to match the potential destination called.

   An unadministered address for a PDD, download server, or speedcall dial string will be accepted and input error warning messages will be suppressed if the appropriate level default address is available.

## Step 8. Entering an X.28 PAD Identification Signal

The **enter x28sig** command is used to configure a message that is sent to all terminal end users when they gain access to a node PAD. Only one signal can be administered per node.

If the X.28 PAD identification signal has been administered and the end user places a call to a PDN or X.25 host, a short message appears on the end user's screen indicating that the terminal is in the PAD waiting state.

## Step 9. Entering a Gateway

A gateway is a set of X.25 ports that serves as an intermediary between a node and a PDN or switch. The **enter gateway** command is used to configure common characteristics for these ports, which share the same addresses on the PDN (multi-line hunt group).

X.3 and CUG profiles for the gateway must be administered with the **enter profile** command before the **enter gateway** command is used. When the gateway is entered with host or PAD support, a set of X.3 parameters in an X.3 profile to be sent to a remote PAD may be selected. A default set of X.3 parameters can be selected, or from one to all 22 parameters can be specified. The default set is designed for interworking with the ISDN terminal adapter (TA) requirements for the 5ESS Switch.

The gateway must be configured before entering the X.25 ports to the PDN. A gateway address (obtained from the PDN or switch administrator) must be specified when the gateway is entered.

## Step 10. Entering Service Addresses

Service addresses must be configured for local groups that can receive calls (including two-way groups) and trunk groups. These service addresses can be mnemonic or X.121 numeric addresses, or both. An X.121 numeric address can also be administered for an originating group; an originating group cannot have a mnemonic address unless it also has an X.121 numeric address.

An X.121 address is needed for node-connected endpoints that connect with PDN endpoints. This address allows the originating address to be passed to the destination using the gateway address mapping feature. If the originating endpoint does not have an assigned X.121 numeric address, the X.121 address of the gateway to the PDN is passed.

Some ports allow administration of an X.121 address directly during port administration (Step 11). When only X.121 addresses and CUG profiles are needed for these addresses, use port administration to conserve database resources.

The **enter address** command is used after groups are defined (Step 7). It is usually, but not necessarily, used before interface and trunk module configuration information is entered. (If PDD/PVC destinations are specified during interface and trunk module administration, service addresses for these destinations should already exist in the database.)

The *Planning Guide* discusses service addresses, their relation to group names, interface and trunk module elements, and routing; the *Commands Reference* gives the parameters for service addresses.

## Step 11. Adding Interface and Trunk Modules

Interface and trunk modules must be entered in hierarchical order with the **enter** <*module*> commands. For example, modules are added before (or sometimes with) their ports. Certain features, like call hold, are activated with the interface and trunk module commands.

### 11a. Configuring Features for Interface and Trunk Modules

Besides the directory, *billing* service address, and select features (Steps 4, 5, and 7a), other features are configured when certain **enter** <*module*> commands are specified, including attention character and action, flow control, call hold, billing information originator, PDDs, and PVCs. For BNS-2000 nodes only, once AI modules are configured for SMDS:

1. Use the **enter ssm4** or the **enter str4** commands to specify AI modules as primary and secondary timing reference sources.
2. Use the **enter threshold** command to set certain parameters for SMDS service.
3. Use the **set trace** command to monitor point-to-point circuits between the node and AIs in an SMDS network; see the *Access Interface Module Reference*.

The *Commands Reference* contains detailed information on the parameters for these commands.

### 11b. Configuring the GAR Module (BNS-2000 Nodes Only)

The GAR module is configured with the **enter gar** command for BNS-2000 nodes that will serve as SMDS ICI group address agents. GAR modules can only be installed in Series M2 Extension Shelves numbered 1, 2, or 3; they cannot be installed in shelves numbered 6 and 7. Assign a slot address to the module, specify the source of its software download, and set measurements *on* or *off*.

Instructions for configuring the ICI group addresses are in the *StarKeeper II NMS Graphics System Guide*.

### 11c. Defining PDDs

Predefined destinations (PDDs) are special virtual circuit connections, defined by the administrator and established automatically by the system, between an originating endpoint and a receiving service. When the originating endpoint is turned on, it is automatically connected to the destination, and the user does not need to originate a call.

The end user on a port connected with a PDD cannot select a destination or switch to a different destination.

With PDDs across nodes only, security works like node security with pattern matching and/or CUGs.

Locally, PDDs are not checked for service access security. Because the administrator sets up the PDD, and would presumably be aware of security issues while doing so, the node does not check the security on a local PDD. Although PDDs are optional arrangements for basic asynchronous service, multiplexed host connections, and X.25 connections, they are necessary for synchronous transport and frame relay services.

PDDs are established with **enter** commands; for example, **enter ty**. Once PDDs are configured, use the **display connections** command to show PDD information for modules and information on active PDDs.

From an end user's perspective, addressing is not an issue with devices connected by PDDs because call setup is automatic and requires no destination code. Administrators, however, must provide addresses for endpoints when they set up PDDs. Using the relevant **enter** commands, at the **`PREDEFINED DESTINATION`** prompt, enter a PDD address in the following format:

Mnemonic address: [*network/area/exchange/]local.[concentrator/]module.port.DLCI*

The exchange, area, and network are not always needed.

For X.25 PVCs, use the following format:

X.121 address: [*dnic/SR/SA/EPN].[concentrator/]module.port.DLCI*

In these address formats, the *port* can be either the virtual frame relay port number on a LAN Protocol Module (LPM) or the physical or virtual port number on a Frame Relay Module (FRM).

For internode PDD connections, the address string is validated only by a check of the network, area, and exchange portion of the address string.

Each PDD service address can be associated with a variety of receiving groups.

### PROCEDURE 4-9. Establishing a Predefined Destination (PDD)

1. Use the **enter group** command to enter a receiving group for the destination endpoints.
2. Use the **enter group** command to enter an originating group for the originating endpoints.
3. Use the **enter address** command to associate the receiving group with a service address.
4. Enter the appropriate modules and channels, using the interface and trunk module **enter** commands.
5. When the channels associated with an originating group are entered, the **PREDEFINED DESTINATION** prompt appears.

   Enter the destination service address (with or without a physical address) at the prompt; this address must have already been administered and associated with a receiving group.

There are some special considerations for PDDs:

- *PDDs and asynchronous services*—PDDs are optional for asynchronous connections but necessary for TSM8. When a PDD is chosen during command specification, the network administrator is still prompted for **ATTENTION CHARACTER** , if applicable, although usually the PDD obviates the need for an attention action by end users. If a PDD port is in a two-way group, and an end user wants to return to receive, the attention sequence is needed to disconnect the call. Here, an **ATTENTION CHARACTER** should be specified and **ATTENTION ACTION** should be configured as *disconnect.* At other times, the **ATTENTION CHARACTER** should be administered as *none* to disable the attention feature.

  If **ATTENTION ACTION** is configured as *command*, the end user at an asynchronous endpoint can display port parameters and set options. The end user can also use call hold, but only to get extra connections to the same destination via the PDD.

- *PDDs and bridging services for BNS-2000 VCS nodes*—PDDs are necessary connections for bridge services. Designated bridge channels are equally distributed between two groups:
  - a receiving group associated with a service address
  - an originating group

  Unlike PDDs for asynchronous services, which can originate on any node in the network, PDDs connecting a bridge module on the node with one on an ISN node must be established from the node side. If you are bridging a module with another on an ISN node, also make sure you have previously administered the area and exchange address for the ISN node.

- *PDDs and switched synchronous service*—PDDs work as in asynchronous service, but the **ATTENTION CHARACTER** prompt is replaced by the **ATTENTION STRING** prompt.

- *PDDs and interworking with ISN*—PDDs between endpoints on a node and an ISN node can be made either from the node or the ISN side, where there is a similar though not identical capability, the permanent virtual circuit (PVC). PVCs are virtual circuits with automatic circuit re-establishment after failure. Though no channels are reserved in advance, once the ISN administrator establishes a PVC, the connection remains intact until the administrator disconnects it. The PVC simulates a "hard-wired" connection.

  PDDs are virtual circuits that are set up automatically by the call processing software; whenever an endpoint is determined by the processor to be ready to participate in a call, the processor places a call to the destination configured (by the network administrator) for that endpoint.

  From the node standpoint, asynchronous PVC functionality is affected only by the optional security feature. For PVCs/PDDs originating on ISN and calling node destinations, if security is enabled, the ISN administrator must set the calling group name as *000*. The network administrator must then configure the destination service name with which ISN endpoint(s) will interact to accept *000* for the originating group security pattern.

  No security checks are made on the ISN originating node for interworked PVCs/PDDs. ISN passes *000* in the dial string to the node.

## Step 12. Verifying the Database

The **verify** commands check the configuration database. Use these commands after each **enter** command to make sure that the information entered is correct; see Routine Database Administration in this chapter and refer to the *Commands Reference*.

## Step 13. Restoring Hardware to Service

The **restore** command puts hardware back into service; refer to the *Commands Reference* for more explanation.

1. At the **`CC0>`** prompt, use the **restore** commands to put the redundant Switch module, interface modules, and trunk modules into service.
2. At the **`MRC>`** or **`MRCM>`** prompt, use the **restore** commands for the redundant Control Computer.

## Step 14. Restoring Addresses to Service

Addresses may have already been put in service when they were entered with the **enter address** command. If the addresses were not placed in service, use the **restore address** command so they can be used; refer to the *Commands Reference*.

### Step 15. Storing Configuration Data

Configuration data is automatically stored on the disk every few minutes, if changes have been made. To make sure that the most recent changes to the database are recorded, use the **sync** command to store them immediately. For more details on synchronizing configuration data between *StarKeeper* II NMS and the node, refer to *StarKeeper* II NMS documentation.

### Step 16. Backing Up the Database

Procedures for backing up the configuration database are explained in the **Node Operations** chapter. At system start-up, it is important to back up the database to a tape. In addition, periodic backups should be made whenever a significant quantity of data is added to the database. Backing up the database preserves all the information entered, if a disk crashes.

## Routine Database Administration

This section describes routine operations for the database, including checking and changing database information, removing and restoring network components to service, and copying and moving module information.

### Verifying the Database

After configuring the database, or whenever you enter information or manipulate database entities, use the **verify** commands to check that the information has been entered as intended. These commands require minimal parameter specification and can be specified in one line. For example, to verify a module in slot 25 of the node, at the **`CC0>`** or **`CC1>`** prompt, enter **verify module 25**.

Each **verify** command results in a report giving the information recorded in the database about the specified object.

The report for a **verify** <*object*> command is the information that was previously entered with **enter** or **change** commands. The report for modules, ports, and addresses will also show if the object is in or out of service; generally, an object must be out of service to change or delete information.

Although most objects of the **verify** command are also used with the **enter** commands, a few, like **host** and **oosports**, are not. These **verify** <*object*> combinations summarize information from various database entries in report form.

If an end user changes port configuration options during a command session, the changed options are stored for the duration of a session in the interface module process, not in the database. The relevant **verify** command, therefore, does not reflect this temporary condition.

## Restoring Objects to Service

Most information is added to the database with the **enter** commands, and the corresponding module hardware is put into service immediately by specifying **in** when prompted for the **`INITIAL SERVICE STATE`** . If **out** is specified initially, objects can later be put into service with a **restore** command. These commands require minimal parameter specification. For example, to restore a module in slot 25 of the node, enter **restore** <*module*> **25**.

When an object is removed from service with a **remove** command, a **restore** command is also used to restore it to service.

A module that is out of service for physical reasons—either it is not installed or is switch-disabled—cannot be restored.

## Removing Objects from Service

Before most parameters can be changed in the database, the objects must be removed from service. Use the **remove** commands. These commands require minimal parameter specification, and can be specified on one line; for example: **remove** <*module*> **27 1**.

## Changing Objects in the Database

When database information requires changes—for example, in port parameters—use the **change** commands to modify most information previously entered. The **change** command parameters are usually equivalent to those for their comparable **enter** commands; a few **enter** command parameters may not appear, however, because they cannot be changed.

The module type, for example, cannot be changed. The original module must first be removed from service and deleted, before entering the new information. The **change** command loops back to the **`MODULE ADDRESS`** prompt; if, for example, **change ty** is entered, another TY module port can be changed without entering the basic command again. To escape the command sequence, press Delete .

## Deleting Objects From the Database

To delete an item from the database, use the **delete** command. For cabinets/shelves, modules, ports, and addresses, the object must be taken out of service before the information about the object can be deleted. (The **remove** command takes these objects out of service.) The **delete** commands require minimal parameter specification, and can be entered in one line; for example, **delete ty 25**.

For BNS-2000 nodes, objects that cannot be deleted include the node and the shelves housing the Switch modules and the active Control Computer. For BNS-2000 VCS nodes, objects that cannot be deleted include the node and the active Control Computer. Once configured, information on the standby Switch module is deleted from the database by using the **change node** command.

## Moving and Copying Modules

The **move module** and **copy module** commands allow simple manipulation of module data that was previously administered in the database. Most interface and trunk modules can be moved and copied. The **move module** command transfers the configuration data for a module and for its components from one slot address to another. The **copy module** command duplicates data on a specified module for another slot address.

Modules that are in the downloading or in-service states cannot be moved or copied. The module must first be removed from service, then the data can be moved or copied from or to any valid address in the database.

The CPMML, CPMML-HS, AI modules, and information about session maintenance trunks cannot be moved or copied with these commands.

An FRM or FRM-M2 can be moved, but not copied. The following procedure outlines a typical sequence of steps for changing an entry or entries in the database.

---

### PROCEDURE 4-10. Changing a Database Entry: Typical Steps

1. Verify information about the entity using the appropriate **verify** command.
2. Remove the module to be changed from service using the appropriate **remove** <*module*> command.
3. Change module information using the appropriate **change** command. To delete the object continue with step 4; otherwise, go on to step 5.
4. Delete module information using the appropriate **delete** command.

   Stop here; modules cannot be restored after they are deleted.
5. Restore the module to service using the appropriate **restore** command; for example, **restore** <*module*>.

# Monitoring the Node

Certain Control Computer commands and MRC commands govern output such as alarm messages, status displays, and a signal that activates the ARU audible alarm in a CO installation. Control Computer and MRC output are independent of each other, although Control Computer output is passed transparently through MRC ports.

## Control Computer Output

When configuring the node with **enter node**, designate the particular port (or ports) for Control Computer output such as alarm messages and reports. The settings entered determine where the Control Computer sends output, typically to the console screen or printer.

During daily administration, it may be desirable to stop the audible alarms or to redirect other output without resetting node parameters. This can be done using Control Computer operations commands. The following table describes the operations commands that govern Control Computer output.

**TABLE 4-4. Commands That Affect Control Computer Output**

| Command Verb-Object | Explanation |
|---|---|
| **enter node** | Specifies if port A or port B of the Control Computer is to receive alarm messages. Also specifies if either is configured for an Alarm Relay Unit (ARU); if so, audible alarms will sound for problems. |
| **retire alarm** | If the ARU is configured with the **enter node** command, the **retire alarm** command turns off critical and major audible alarms when they sound. Minor audible alarms are self-retiring. |
| **route output** | Directs Control Computer output from the port A interface (the default console screen) to port B. |

The Control Computer sends the following types of messages to the console screen or printer, depending on how the system is configured:

- command error messages, also referred to as system responses
- command reports
- status and alarm messages

## MRC Output

MRC display output is available at any port, but only through commands entered at the **`MRC>`** prompt. Using the **display** commands, information can be obtained at port M and, if so configured, at ports A and B.

**NOTE:** All prompts and output are shown in this guide as they are displayed on screen with a CCM system using an MRCIO. In an ECPU system, the MRCM will continue to display **`MRCM>`** and **`MRCM/mrcm`** in the output.

In a node with an MRC, the MRC sends alarms to port M automatically, and to ports A and B if configured to do so with an MRC **set** command. The MRC **set** command also configures ports A and B for an ARU that provides audible alarms. The M port is preset for *aau off* and *alarm on*, but the administrator can reconfigure these values.

The following table summarizes the commands that govern MRC output.

**TABLE 4-5. Commands That Direct MRC Output**

| Command Verb-Object | Explanation |
|---|---|
| **set a** <*aau, alarm*> <*on, off*> | Sets port A to receive an MRC-generated signal that activates an audible alarm (*aau on*), or to receive MRC-generated alarms. Status messages are also sent if *alarm on* is configured and the console or workstation is in MRC command mode. |
| **set b** <*aau, alarm*> <*on, off*> | Sets the MRC port B to receive an MRC-generated signal that activates an audible alarm (*aau on*), or to receive MRC-generated alarms. Status messages are also sent if *alarm on* is configured and the console or workstation is in MRC command mode. |

Since MRC ports A, B, and M can be used to enter commands to the MRC at the same time, the system warns administrators about activity at other ports. When a command is successfully executed, a status message like the following is sent to all ports configured with alarms *on* that are in the command mode state. As the example shows, all MRC-generated output is labeled **MRC** after the message identification number, for example:

```
98-12-31 12:44:32  NODE=node11
1234B  MRC
REPORT COMMAND:  INPUT ON PORT <x>  restore standby
```

The MRC transparently reports Control Computer messages to ports configured to receive them. It also generates its own messages. The headers on the MRC-generated messages identify information entered with MRC commands.

The following table gives the MRC commands that affect message output from the MRC.

**TABLE 4-6. Commands That Affect MRC Messages**

| Command Verb-Object | Explanation |
|---|---|
| **set address** | Specifies an address (slot position in the shelf) for the MRC. This address appears in the report generated by the MRC **display status** command. |
| **set name** | Specifies the name of the local node, which will appear on MRC-generated reports, responses, and alarms. (This name should match the one displayed with the **verify node** command; the system does not check if they match.) |
| **set time** | Sets MRC time; the **set time** command is also used to manually synchronize the node time with the MRC setting. MRC time is initially factory-set to Eastern Standard Time (EST) and maintained by a battery. |

# Obtaining On-line Reports

This section provides a brief overview of the kinds of reports available for routine database administration. The system supplies four different kinds of reports on system components:

- verifications
- displays
- status displays
- measurements—two special commands, **set** and **schedule**, work with measurement reports

For detailed information on the reports for each command–object combination, refer to the relevant command entry in the *Commands Reference*.

## Verifications

The node administrator uses the **verify** command to check information previously entered in the database. This command is especially helpful when the node is set up because it allows the administrator to check the database as it is configured. The **verify** command is also helpful as a first check when monitoring the node. If a problem arises, check the database first to make sure a particular component is configured correctly.

If an end user changes port configuration options during a command session, the options change *only* for the duration of the call and are not stored in the database. The relevant **verify** commands, therefore, do not reflect this temporary condition.

The information obtained through **verify** is static; the data generally reflects information that was entered into the database with the **enter**, **change**, **copy**, or **move** commands, and does not register traffic or faults.

An exception is that **verify** commands report current service states (in-service or out-of-service) for modules. For the Switch module, however, use the **verify node** command and then enter the **dstat switch** command.

## Displays

The node administrator uses **display** commands to check the hardware and software status of a variety of objects. One **display** command is used to check the system time; two commands, **display connections** and **display traffic** (BNS-2000 only), furnish information on PDDs and virtual circuits for modules, groups, or hosts.

The information provided by these commands changes, depending on what is happening in the node. When the **display eia** command is entered, for example, only the status of the leads specified appears. This dynamic data contrasts with the static configuration database information obtained through the **verify** commands. For certain objects, the **display** command allows a list or range to be displayed.

In addition to transparently reporting Control Computer displays, the MRC generates its own displays of MRC-specific information.

## Status Displays

The node administrator uses the **dstat** command to detect problems that the alarm system might not detect, and to analyze problems that the alarm system does detect. The command provides current hardware status information about an individual module or the entire node.

The reports generated by the **dstat** commands derive from two sources:

- *hardware information*—gathered by the system through its automatic polling of hardware components. The current status of the module hardware (that is, the board) and its resident firmware is reported. The status information is updated about every two seconds; some of the fields in the status displays are cumulative; some are not.

  When the module is restored to service, the counters for the cumulative fields are initialized to zero and are then updated every two seconds.

- *software information*—gathered from the component specified when the command is issued

A low or high level of detail can be requested in a **dstat** report:

- *low* (the default)—is used for usual system monitoring
- *high*—is used for troubleshooting and maintenance

The fields on the **dstat** command output will vary depending on the command–object combination and if the request is for high or low detail.

This command will accept a single module address and ranges and comma-separated lists of modules. It does not allow specification of *all*, however, and there is no default.

The MRC mode command, **display status**, is also available.

#### Switch Module Status Displays

Status information for the active and standby Switch modules is displayed with the **dstat switch** command. Either a *high* or *low* detail report can be requested.

#### Stratum 4 Clock Status Displays (BNS-2000 Only)

Status information for the Stratum 4 Clock (the SSM4 or CMC3 I/O board) is displayed with the **dstat ssm4** command. Status information for the Stratum 4 Clock (the STR4 and the extended switch complex) is displayed with the **dstat str4** command. The level of detail output for either command can be *high* or *low*.

#### GAR Status Displays (BNS-2000 Only)

Status information for the GAR is displayed with the **dstat gar** command. Either a *high* or *low* detail report can be requested.

## Measurement Reports

Measurement reports are highly effective tools for identifying and locating node problems. These reports provide available traffic measurements and, sometimes, performance measurements. Data about call setup, module connections, channel connections, and trunk use are included.

By monitoring the reports, an administrator can determine if the node is operating effectively and suggest equipment changes. The reports are generated in two ways:

- *on demand*—obtained with the **dmeas** command; available on the node console. For explanations of the report fields, see the **dmeas** commands in the *Data Networking Products Commands Reference*.
- *scheduled*—obtained at specified intervals with the **schedule** command; if the NMS is monitoring the node, available only on *StarKeeper* II NMS via the Performance Reporter. A **schedule** command can be used to schedule many of the same reports that are available on demand with **dmeas**.

On-demand reports can also be obtained with the **schedule** command, and the **set cpackets** command works with the measurement reports; see the *Commands Reference*. An on-demand report differs from its comparable scheduled report only in the report header.

Most measurement reports can be obtained both on demand and through scheduling. The following table tracks the differences.

## TABLE 4-7. Availability of Measurement Reports

| BNS-2000 Availability | BNS-2000 VCS Availability | Report | On-demand | Scheduled |
|---|---|---|---|---|
| √ | | **ai** | √ | √ |
| √ | √ | **bsc3270 (SYNC8)** | √ | √ |
| √ | √ | **concentrator** | √ | √ |
| √ | √ | **connections** | √ | √ |
| √ | √ | **cpackets** | √ | |
| √ | √ | **cpmml** | √ | √ |
| √ | √ | **dkap (hsdkap)** | √ | √ |
| √ | | **frm** | √ | * |
| | √ | **frm** | √ | √ |
| √ | | **frm-m2** | √ | * |
| √ | | **gar** | √ | √ |
| √ | √ | **lpm** | √ | * |
| √ | √ | **mpackets** | √ | |
| √ | √ | **node utilization** | — | √ |
| √ | √ | **periodic_bill** | | √ |
| √ | √ | **sam** | √ | √ |
| √ | √ | **samml** | √ | √ |
| √ | √ | **sdlc8** | √ | √ |
| √ | | **shelf** | ** | √ |
| √ | √ | **trunk** | √ | √ |
| √ | | **trunk-pq** | √ | * |
| | √ | **trunk-pq** | √ | √ |
| √ | √ | **tsm8** | √ | √ |
| √ | | **tsmt1** | √ | * |
| | √ | **tsmt1** | √ | √ |
| √ | √ | **x25** | √ | √ |
| √ | √ | **x25p** | √ | √ |
| √ | | **x75** | √ | * |
| | √ | **x75** | √ | √ |

* Available only on *StarKeeper* II NMS.

** Available only for Series M1 Shelves.

# Checking the File System and Disk Storage

Maintaining the node includes checking the overall integrity of the file system and disk storage. During software boots—initiated through commands such as **initialize controller**—the software automatically checks the file system and clears it of errors.

In a dual Control Computer system, a hardware reboot or reset of the standby Control Computer triggers an automatic file system check and clears errors. The file system check command, **fsck**, can also be used to pinpoint problems.

## Utility Shell

Using the commands available at the utility shell prompt (**`UTILITY>`**) on a regular basis helps prevent problems with disk resources. To use these commands, enter the utility shell by using the **initialize standalone** command.

---

### PROCEDURE 4-11. Accessing the Utility Shell

**Application:** Active Control Computer of any node.

**Switches:** CC0 or CC1: ENABL.

1. Go to the **`UTILITY>`** prompt, by entering **initialize standalone**.

```
CC0>  initialize standalone

***  Trying to Boot from Primary Disk  ***

A  Recovery REBOOT
   Reason: SOFTWARE INITIATED BY ADMINISTRATOR

 Active CC
Loading text
Loading data
Clearing bss

   Booted from Device: 5/0
   Local Memory Size = 0x2000000
   Available Memory: 0x1f37800 End of Supervisor: 0x157932


WARNING:  SYSTEM RUNNING SHELL ON BOTH PORTS A AND B.
          DO NOT RUN COMMANDS FROM BOTH PORTS SIMULTANEOUSLY>

Entering the stand-alone shell on PORT A.

MINI-SH: What can I do for you?
UTILITY>
```

**PROCEDURE 4-11. Accessing the Utility Shell** (continued)

2. At the **UTILITY>** prompt, enter the required commands.

## File System Check

When the system software is booted, inodes (storage for administrative information such as pointers to files) are assigned to the processes so that they can access the file system and I/O devices, and files are opened to start call processing and run the I/O devices. If the system is interrupted, these inodes and files are not properly closed, and the system maintains the information that they are in use. The next boot is accompanied by more inodes being allocated and used. Since the inodes and files are a limited resource, eventually there will not be enough to support running the system. If this occurs, messages may appear like the following, and the node will not continue to boot or there may be an aborted boot.

```
no INODES available
cannot create UNIX
no file space left
```

Slowly degrading system performance may point to open files and allocated inodes that are not serving a useful purpose. When indicators are unclear about the cause of degradation or when the node has been improperly interrupted in operation, as with an unpredicted power loss, use the **fsck** command to check and clear some problems.

**CAUTION:** Do not use the **fsck** command on the active device (the file system from which the active Control Computer booted and the system is running). Use the **dstat cc** command to find out the identity of the boot device and confirm which Control Computer is active.

During a reboot, the active Control Computer runs **fsck** automatically on the active file systems on its disk, thereby recovering lost resources. In dual Control Computer configurations, the standby Control Computer automatically runs **fsck** on the active and standby file system on its disk (unless the active Control Computer was booted from the same disk). The **Node Troubleshooting** chapter and the *Commands Reference* contain more details on the **fsck** command.

## Database Resizing

With the autoresize feature, the system software allocates space to tables in the database to hold configuration data. The tables are populated as the node administrator enters data. The system uses default sizes for each table in the database.

As a node uses more resources in one area and less in another, resizing of the database is available based on current usage. The system will calculate the new table sizes. The **dbaudit** command shows the current use of these resources. If the **dbaudit** report reveals a shortage of resources in some areas, the node administrator can use the **dbresize** command to resize the database tables. Once new database table sizes have been generated, the system must be rebooted for them to take effect. Reports are available that show the old table sizes, the current usage, and the new table sizes, specified as the number of entries in the tables.

More information on database resources is given in the *Planning Guide*.

# Node Maintenance


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# Node Maintenance

This chapter includes guidelines for general care and handling of circuit packs, disk and tape drives, and cabinets/shelves. It also includes scheduled maintenance for the BNS-2000 fan tray, tape drive and wrist straps.

## Handling and Environment Guidelines

All synthetic materials can generate static electricity and cause damage to circuit packs (modules and I/O boards) unless precautions are taken. Damage to circuit packs may not be detected during testing, since the circuit packs may appear to operate normally before failing.

### Rules for Handling Circuit Packs

- Do not handle circuit packs without using a properly grounded wrist strap.
  - — Attach the strap end of the properly grounded wrist strap securely to a bare wrist and wear it at all times when handling circuit packs. The strap should have direct body contact; never attach it over clothing.
  - — If a clip is attached to the wrist strap, remove the clip and plug this end into the grounding jack on the front or rear of the shelf; see the **Node Installation** chapter.
  - — Every month check to be sure the wrist strap provides proper grounding, using the procedure for checking the strap's continuity in this chapter.
- Do not remove circuit packs from their protective packaging until they are needed.
- Do not hand a circuit pack to an ungrounded person.
- Place circuit packs on an antistatic mat after removal.
- Handle circuit packs by the outside edges only.
- Do not let circuit packs come into contact with sources of static charge such as clothing and common plastics.
- Do not permit common plastics, such as coffee cups, in work areas.
- Do not attach gummed labels, cellophane tape, or similar materials to circuit packs.
- Do not unseat and reseat circuit packs frequently or the contacts may be damaged.

- Do not stack circuit packs directly on top of one another.
- Repackage circuit packs in the antistatic bags and their original shipping cartons only.

## Rules for Handling Disk and Tape Drives

- Do not unbox a drive until just prior to installation, except for an initial inspection.
- Do not stack unboxed drives.
- Do not drop a disk drive or expose it to shock by jarring it.
- Do not apply lubricants or cleaners to the tape drive except as directed in the maintenance procedures.
- Insert only approved tapes into the tape drive:
  - — a 40MB tape cartridge is used with an ECPU system
  - — a 60 meter DDS tape cartridge is used with a CCM system

  Refer to the **Node Operations** chapter for the correct way to insert and remove tapes.

## Rules for Handling Tapes

- Allow the tape to stabilize at room temperature for at least four hours, if it has been transported from another environment.
- Do not touch the tape surface or rollers.
- Keep tapes away from X-rays, magnetic fields, direct sunlight, excessive moisture, or temperature changes.
- Do not drop the tape or expose it to shock by jarring it.
- Ensure that the release tape is write-protected; then store it in a safe place.
- Label all tapes and store them in their protective cases when not in use.

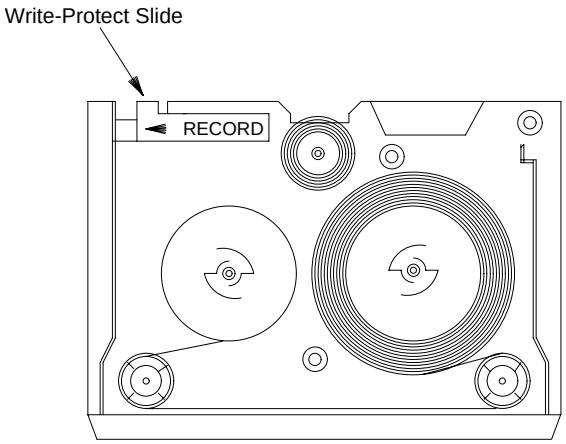



**FIGURE 5-1. 40MB Tape Cartridge for ECPU System Tape Drive**

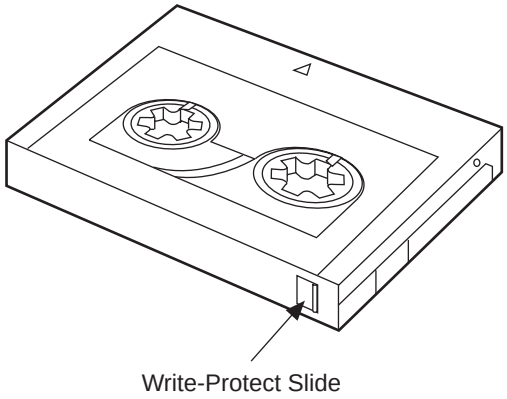



**FIGURE 5-2. CCM System DDS Tape Drive (Internal/External)**

## High Temperature and Humidity Guidelines: DDS Tape Drive

In the CCM system, if the tape drive detects moisture (dew), the yellow rectangular LED on the front panel flashes rapidly. Follow the guidelines below to minimize the possibility of extreme temperature or humidity causing problems:

- Do not store cartridges at temperatures below −40°C (–40°F).
- Use DDS cartridges only at temperatures between 5°C (40°F) and 40°C (113°F).
- Do not leave cartridges in severe temperatures, such as in a car in bright sunlight.
- Avoid extreme changes in temperature or humidity, if possible.
- If cartridges are exposed to temperatures or humidities *outside* the specified operation environment, condition them by exposure to the operating environment for a time at least equal to the period the cartridges were exposed (up to a maximum of 24 hours).
- Place an external drive in a position that provides stable temperatures. Do not place the drive near open windows, fans, heaters, or doors.
- Do not read from or write to cartridges when a temperature change of 10°C per hour is occurring.

## Environmental Guidelines for Cabinets/Shelves and Base Power Units

- Keep the front doors closed for proper air circulation.
- Do not allow paper to become lodged under or behind the fans in the shelf.
- Do not block the front and rear air entry and exit openings of the shelf.
- Keep the area around the shelf and Base Power Unit clean and free of debris.
- Check air filters on the Series M2 Shelves routinely for cleanliness.

The following equipment requires no additional maintenance:

- Base Power Unit
- Series M1 Shelf power supplies (fuses in the power supplies are *not* replaceable on site)
- disk drive
- CO frame

# Preventive Maintenance

Scheduled preventive maintenance procedures for the air filters on Series M2 Shelves, Base Power Unit, tape drive, and wrist straps are listed in the following table.

**TABLE 5-1. Scheduled Hardware Maintenance**

| Equipment | Maintenance Interval | Action |
|---|---|---|
| Series M2 Shelf Air Filters | Whenever dirt accumulation is apparent | Clean or replace; Procedure 5-1 |
| Tape Drive | Weekly if backups are done > twice a week<br>Monthly if backups are done < twice a week | Clean with kit; Procedure 5-2 (CCM) or 5-3 (ECPU) |
| Wrist straps | Monthly | Check continuity; Procedure 5-4 |
| Controller Switchover | During a scheduled maintenance interval | See Procedure 3-14 |

## Maintaining Series M2 Shelf Air Filters

Air filters are located to the right of the fan tray in Series M2 Shelves. Old filters can be thrown away or cleaned, depending on the amount of dirt accumulation. Use the following procedure to replace or clean an air filter.

---

### PROCEDURE 5-1. Replacing or Cleaning Air Filters in Series M2 Shelves

**Application:** Air filters in BNS-2000 Series M2 Shelves.

1. Use the tab on the filter to pull it out of the shelf.
2. To clean the filter, rinse it with running water.
3. Wait until the filter is thoroughly dry before reinserting.
4. Insert the cleaned (or new) filter. (Hold the metal screen to the left adjacent to the fan tray.)

## Maintaining Tape Drives

The following procedures will help keep the tape drive in good working order. If excessive magnetic dust or debris collects at one or more of the heads, magnetic media may become unreadable or unwritable, depending on the media used.

## DDS Tape Drive Automatic Spin-down and Write

To maximize tape and drive mechanism life, and to preserve against any possible loss of data, the DDS drive (for the CCM system) automatically executes the following routines:

- When no tape READ or WRITE activity occurs,
  - — after 30 seconds, the capstan and pinch roller are released; tape tension is removed
  - — after 90 seconds, the tape is pulled away from the cylinder, and the cylinder is stopped
- If a READ or WRITE operation occurs, normal operation resumes with no affect on node operations
- If tape WRITE operations cease, the data buffer may remain partially full; after one (1) minute with no activity, the drive automatically writes the partial buffer to tape, minimizing the possible loss of data if power fails
- If data to be written remains in the buffer, and the eject button is pushed, the data is written to tape before the tape is rewound and ejected.

### PROCEDURE 5-2. Cleaning the Tape Drive Head in a CCM System

**Application:** Internal or external tape drives used with a CCM.

**Requirements:** Node can be operational. Use only an Archive-qualified DDS DAT cleaning cartridge (you can order Model M7301, in packages of five); do not use an audio DAT cleaning cartridge (it will not be recognized by the drive).

1. Clean the drive heads
   - when the Cassette In Place green status LED flashes
   - as routine maintenance, every 25 hours of read/write operation.
2. Insert the cleaning cartridge into the drive. The cartridge contains the correct recognition holes, so the drive immediately recognizes that it is a cleaning cartridge.
3. The drive loads, runs the cartridge for about 30 seconds, and then ejects the cartridge.

   **NOTE:** A cleaning cartridge can be used approximately 30 times. Each time the cartridge is loaded, a new, unused portion of cleaning tape is advanced over the entire tape path. Eventually, the entire cleaning tape is used, and a new cartridge is required.

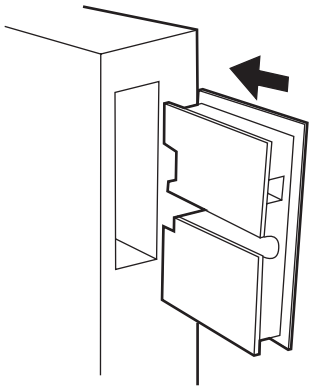
---

### PROCEDURE 5-3. Cleaning the Tape Drive in an ECPU System

**Application:** All nodes with an ECPU.

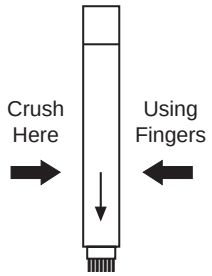
1. Insert the cleaning cartridge into the drive, with the label on the cartridge to the *left*.

   The motor should start turning, and the red LED should light. If not, reseat the cartridge and try again.

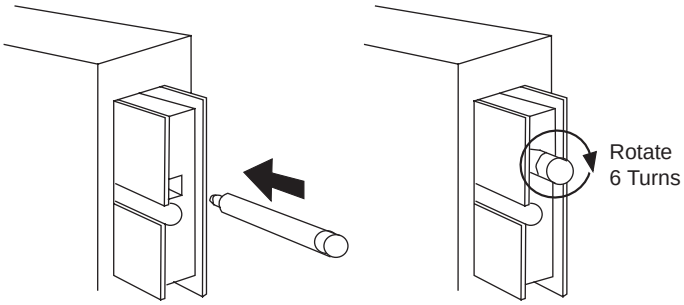


2. Prepare the cleaning wand for use:
   a. Holding the wand with its bristle down, squeeze the wand in the center.
   b. Continue squeezing the wand to release enough fluid to saturate the bristles.

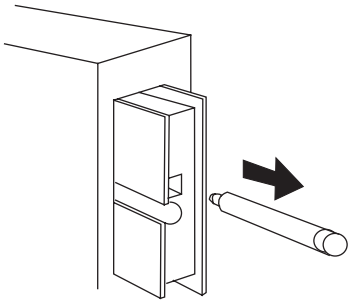
**PROCEDURE 5-3. Cleaning the Tape Drive in an ECPU System** (continued)




3. With a gentle twisting motion, insert the wand into the lower part of the cleaning cartridge until resistance is met, then rotate the wand six turns while gently pulling and pushing the end of the wand.

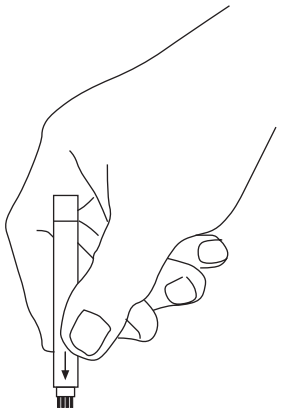



4. Remove and discard the used wand.

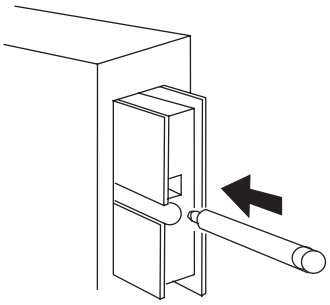


5. Prepare a second wand as in step 2.

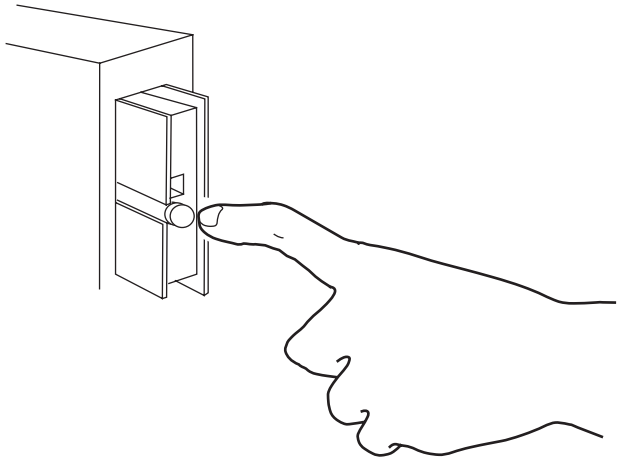
**PROCEDURE 5-3. Cleaning the Tape Drive in an ECPU System** (continued)



6. Insert the wand into the capstan slot, in the center of the cartridge.



7. Immediately apply a gentle forward pressure to the wand end for 15 seconds.



**PROCEDURE 5-3. Cleaning the Tape Drive in an ECPU System** (continued)

**NOTE:** The capstan should already be turning and the sound of the wand rubbing against the capstan should be evident. If this rubbing sound is not heard, or if the drive LED flashes or goes off, press the tape ejector, completely remove the cartridge from the drive (the wand does not have to be removed). Then carefully re-insert the cartridge.

8. Remove the cleaning cartridge and store it for the next cleaning. The drive is now clean and ready for use.

## Maintaining Wrist Straps

As wrist straps get older, they may become damaged and lose continuity. Use the following procedure to check wrist straps each month with an ohmmeter.

---

**PROCEDURE 5-4. Checking a Wrist Strap for Continuity**

**Application:** All ESD wrist straps used with the node.

1. Connect one lead of the ohmmeter to the wrist strap band.
2. Connect the other lead of the ohmmeter to the wrist strap plug or clip.
3. The ohmmeter should measure 900K–1.1M Ohms. If the reading is not within this range, discard and replace the strap.

# Node Troubleshooting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# Node Troubleshooting

In troubleshooting there is often no simple correspondence of symptom to cause. Rather, the entire range of symptoms must be considered together and possible causes gradually eliminated. The following equipment may be needed for troubleshooting tasks:

- loopback connectors (see appropriate module reference)
- external test equipment including data line monitor, digital voltmeter, breakout box, and protocol analyzer (optional)
- documentation for particular hosts or terminals on the network, and for devices provided by the customer (for example, a guide to using a printer)

The first step in troubleshooting is to observe the problem indicators. The next step is to take the appropriate actions; see the tables on module LEDs. Many problems require running status reports and diagnostic tests on modules in the node. The system provides the automatic status polling, status LEDs, and diagnostic tests (on-line, off-line, and MRC) for modules in the node.

If problems are still unresolved after these troubleshooting procedures and those in other appropriate documents, contact your customer support representative.

## Problem Indicators

Problem indicators include alarm messages, LEDs, and problems observed on the administration console, at end user devices, or after installation or maintenance activity.

### Alarm Messages

The system detects a variety of malfunctions, including module malfunctions, access failures, Control Computer operating system errors, and changes in hardware status. When a malfunction is detected, the system sends a message to the printer or console. These messages can apply to a module, to a shelf in the node, or to the entire node.

MRC messages are sent automatically to ports A, B, and M, if the node is configured to receive them. Audible alarms may be associated with alarm messages, if an ARU is configured on the node.

Six types of alarms are generated by the Control Computer. Three types are generated by the MRC. The following table lists the names and gives a brief explanation of the message types.

**TABLE 6-1. Alarm Message Types**

| Control Computer Alarms | |
|---|---|
| **Message Type** | **Explanation** |
| **REPORT ALARM:** | Reports cabinet/shelf and module problems, including hardware failures, problems with node configuration, and software problems related to interface and trunk modules. |
| **REPORT ERROR:** | Reports software process errors in the Control Computer. |
| **REPORT FAILURE:** | Reports a variety of access failures and problems outside the node. |
| **REPORT PANIC:** | Reports serious node operating system errors, bad disks, or Control Computer hardware failure. |
| **REPORT STATUS:** | Reports the current system status. This message does not warn of problems but is important for system monitoring and administration. For example, this type of message appears if a module's service state changes or if the MRC is reset. |
| **REPORT SYSERR:** | Reports Control Computer process and software errors. |
| **MRC Alarms** | |
| **Message Type** | **Explanation** |
| **REPORT ALARM:** | Reports hardware failure related to either the active or standby Control Computer. |
| **REPORT COMMAND:** | Reports information regarding user input of MRC commands. |
| **REPORT STATUS:** | Reports current system status information important to node administration. |

The *Messages Reference* includes a directory of messages and an introduction that gives more information on message fields. This section discusses alarm message format, alarm thresholds, alarm intervals, and alarm-handling strategy.

### Alarm Message Format

Node messages follow a format that identifies the general type of alarm (through the message type name), the severity level, the specific problem area (through the message body), the components involved, and the recommended action (through additional fields). Messages may consist of several fields of information as shown in the following sample screen.

```
   97-12-15  11:39:05  NODE=adam
*  1234<B>  MODADDR=25    PORT=12 MODTYPE=ty12
   REPORT FAILURE:  term:  Too Many Invalid Destinations
   Possible Babbling Port, Connection Status = FIX
   Rec act:  Investigate Source of Bad Dial strings.
```

**SCREEN 6-1. Message Example**

The explanations for these fields of information are as follows:

- The first line gives the date and time of the message, and the name of the node reporting the problem.
- The second line gives a priority-of-action code; a message identification (ID) number, when appropriate; and identification of the components affected. When the message is generated by the MRC, the message source appears after the message ID number. For example, for BNS-2000 nodes: **`1234B MRC`** ; and for BNS-2000 VCS nodes: **`1234 MRC`** .

The priority-of-action code indicates the alarm severity. The following table explains the codes that can appear in this field and their corresponding alarm category.

**TABLE 6-2. Priority-of-Action Codes for Alarms**

| Code | Alarm | Explanation |
|---|---|---|
| ***C** | Critical | Indicates that the node is inoperative. Likely causes are loss of power to the node; Switch or Control Computer module, or cable failure; more than one active Control Computer; or software errors. |
| ****** | Major | Indicates a serious, service-degrading condition; service interruption may occur on a significant portion of the node. Likely causes are interface or trunk module failures, including a blown fuse; environmental extremes, such as high temperature in a shelf; or an active Control Computer reset or Control Computer switchover. |
| ***** | Minor | Indicates a secondary problem or transient condition not likely to affect overall service. If multiple minor alarms are reported, however, they indicate a serious condition affecting the system overall. Some likely causes are parity errors and FIFO overflows. |
| *none* | Informational | If an alarm has no priority-of-action code, the message generally contains system status or administration information. |

- The third line gives the message type followed by a specific message that briefly describes the problem, as in the following example:

```
REPORT ALARM:  12-volt power failure
REPORT ERROR:  config:  Cannot update /etc/cfdata
REPORT FAILURE:  term:  Too Many Invalid Destinations
REPORT PANIC:  sysmsg:  unable to send message
REPORT STATUS:  config:  Creating SWITCH cmd channel
REPORT SYSERR:  Root device off-line
```

- Subsequent lines of text in an alarm message consist of further explanation. The **`Rec act:`** field (recommended action) gives brief instructions for resolving the problem (some messages omit the **`Rec act:`** field); see the *Messages Reference*.

### Alarm Thresholds

The alarm threshold is the number of times the error must occur before an alarm condition exists. Some alarms are not activated unless the same error occurs more than once during a two-minute time interval. To activate an alarm, the number of errors must reach the threshold in one 2-minute interval. At the end of each interval, all errors are cleared and a new interval begins. If no threshold is indicated for the alarm, one error in a time interval causes an alarm. As long as the alarm condition exists, alarm messages will be sent to the console at specified intervals.

### Alarm Message Intervals

The time that elapses between reports of identical alarms is called an alarm interval. An interval applies only to **`REPORT ALARM:`** messages as follows:

- Critical Alarm (**`*C`**): 15 minutes
- Major Alarm (**`**`**): one hour
- Minor Alarm (**`*`**): one hour

All other alarm messages (for example, the **`REPORT STATUS:`** type), will print each time the condition occurs.

See the **dstat** command in the *Commands Reference* and the *Messages Reference* for more information on alarm thresholds and alarm intervals.

### Alarm-handling Strategy

When a problem results in an alarm message or audible alarm, attend to critical (**`*C`**) and major (**`**`**) alarms before responding to the minor (**`*`**) alarms. Start with alarms that indicate a general problem, then check less severe or more localized alarms.

## LEDs

LEDs identify which module(s) are affected and how:

- Green LEDs indicate the module is in service and functioning normally. On Reference Input Boards (RIBs), Green LEDs indicate that the RIB is active. (See the following RIB LED table for more details.)
- Yellow LEDs on the power supplies, Control Computer, CIM, CTRM, and Switch modules indicate that the module is off-line. Service may be interrupted for the entire node.
- Yellow LEDs on the GAR, or any interface or trunk modules normally indicate that the module is being diagnosed, or some type of fault has occurred, or an interface module is disabled. Service may be interrupted for end users on the module or groups of end users who share that interface.
- Red LEDs on the power supplies, Control Computer, CIM, GAR, CTRM, and Switch modules indicate a general problem affecting the entire node. (The entire node may be out of service.)

- Red LEDs on interface or trunk modules indicate a problem affecting end users on the module or groups of end users who share that interface. (A module is out of service or some type of fault has occurred.)

The following tables give details on LED states.

**TABLE 6-3. CCM LEDS**

| CCM (TN2235) for BNS-2000 Node CCM System | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Red (Fault) Lit | Fault | Run monitor or loader mode diagnostics. |
| Yellow Lit | Offline | Put controller mode switch in ENABL position. |
| Green Lit | On-line | None |
| Green and Yellow Lit | On-line diagnostics | Mode switch in DIAG position allows access to other command modes for booting. Disable, enable, and reset the module. If fault persists, run diagnostics. |
| Red (Diag Fail) Lit | Diagnostic failure<br>Fault | Disable, enable, and reset the module. If fault persists, run diagnostics.<br>Run **dstat cc** command. |
| Amber (Disk) blinking | Disk being accessed | None |
| Green (Cntr Active) | Active controller | None |

**TABLE 6-4. CIM/CTRM LEDS**

| CIM (CMA2)/CTRM (TN2096) for BNS-2000 Node CCM/ECPU System | | |
|---|---|---|
| **Indicator*** | **Module Status** | **Actions** |
| Green Lit | On-line | May be lit when auto-enabled CIMs are off-line. |
| Yellow Lit | Off-line | Move mode switch to ENABL. |
| Red Lit | Fault | Check bus overloads, shelf address.<br>Disable, enable, and reset the module. If fault persists, run diagnostics. |
| * The status of the LEDs on the CTRM is always the same as the status of the LEDS on the CIM to which the CTRM is connected. | | |

### TABLE 6-5. Clock LEDs

| Clock (TN1001B) for BNS-2000 VCS Node CCM/ECPU System | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Green Lit | On-line | None |
| Yellow | Off-line | Boot node; put the mode switch in ENABL. |
| Red Lit | Fault | Check **dstat** for bus errors.<br>Disable, enable, and reset the module.<br>If fault persists, run diagnostics. |
| Red Lit (blinking) | | Check **dstat** for bus errors. |

### TABLE 6-6. CMA1 Switch LEDs

| CMA1 Switch for BNS-2000 Node CCM/ECPU System | | |
|---|---|---|
| **Indicator*** | **Module Status** | **Actions** |
| Both Greens Lit | RAM mode, on-line in service | |
| Both Greens Lit and Yellow (test mode) Lit | Test | Disable, enable, and reset module. |
| Red Lit | Fault | Disable, enable, and reset module. If fault persists, run diagnostics. |
| Yellow (off-line only) Lit | Standby out-of-service | Restore standby Switch |
| Yellow (off-line) and Green (RAM mode) | Standby in service | |

* The Switch module has five LED indicators on its faceplate.

### TABLE 6-7. CTG13 Switch LEDs

| CTG13 Switch for BNS-2000 Node CCM/ECPU System | | |
|---|---|---|
| **Indicator*** | **Module Status** | **Actions** |
| ON-LINE and RAM lit (both green) | RAM mode, on-line, in service | None |
| ON-LINE, RAM lit (both green), and OFF-LINE (yellow) lit | Test | Disable, enable, and reset module |
| FAULT (red) lit | Fault | Disable, enable, and reset module. If fault persists, run diagnostics. |
| OFF-LINE (yellow) | Standby, out of service. | Restore standby switch. |
| OFF-LINE (yellow) | Standby. | In service. |
| TEST (yellow) | Test mode. | None |
| SU ACTIVE (green) | Switch module contains active SYNC unit. | None |
| SU ENABLED (green) | SU is configured and enabled. | None |
| SU FAIL (red) | SYNC unit failed. | Run diagnostics; replace unit if necessary. |
| * The switch module has eight LEDs on its faceplate. | | |

### TABLE 6-8. CSD9 LEDs

| CSD9 for BNS-2000 and BNS-2000 VCS Node CCM Systems | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Red Lit* | SCSI bus fault | Connect SCSI cable properly. If light persists, look for bent pins and replace cable. |
| * During an upgrade when the 40MB tape drive is used, it is normal for this LED to be lit. | | |

### TABLE 6-9. Disk or Tape Drive LEDs

| Disk (TN2175B) or Tape (TN2097) for BNS-2000/BNS-2000 VCS Node ECPU System | | |
|---|---|---|
| **Indicator** | **Drive Status** | **Actions** |
| Green Off | Fault or no 12V power | Check power to drive and cabinet.<br>Check slot fuse. If blown, replace fuse. If fuse blows again, replace drive.<br>Verify that latch is properly secured. |
| Green Lit | Drive has power | |
| Red Off | Drive inactive or no 12V power | Check power to drive and cabinet.<br>Check drive fuse. If blown, replace drive. |
| Red Lit (blinking) | Drive being accessed (random blinking)<br>Fault (steady blinking) | Run loader mode diagnostics from tape.<br>If drive is faulty, replace drive. |

### TABLE 6-10. ECPU LEDs

| ECPU (MC1D138A1) for BNS-2000 and BNS-2000 VCS Node ECPU Systems | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Red Lit | Fault | Run monitor or loader mode diagnostics. |
| Yellow Lit | Standby | Lit for standby Control Computer. |
| Green Lit | Active | None |

### TABLE 6-11. Eswitch LEDs

| Eswitch (TN2099) for BNS-2000 VCS Node CCM/ECPU System | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Green Lit | Active | None. Lit when Eswitch is active. |
| Green (Standby) Lit | Standby | None. Lit when Eswitch is standby. |
| Red Lit | Test/Fault | Disable, enable, and reset module.<br>If fault persists, run monitor or loader mode diagnostics. |
| Yellow Lit | Off-line (or ROM mode) | Restore Eswitch.<br>Light is on when downloading data. |

### TABLE 6-12. External Tape Drive LEDs

| External Tape (ED3P325-30,G407) for BNS-2000/BNS-2000 VCS Node CCM System | | |
|---|---|---|
| **Indicator** | **Drive Status** | **Actions** |
| Yellow Lit | The drive is reading or writing the tape. | None. |
| Yellow Flashing Rapidly | A hardware fault occurred, or dew was detected. | Run diagnostics or replace the drive. |
| Green Lit | A cartridge is inserted and does *not* generate excess errors. | None. |
| Green Flashing Slowly | A cartridge is inserted but generates excessive errors beyond a predefined error threshold (*warning only*). | Use a DDS cleaning cartridge to clean the drive heads. |
| Green Flashing Slowly with Yellow LED Flashing | A prerecorded audio cartridge is inserted and is being played automatically. | Use only a DDS Tape. |
| Round Green Lit | The external drive is powered on. | None. |
| Green Flashing Rapidly | Could not write tape | Clean tape head or replace cassette. |

### TABLE 6-13. GAR LEDs

| GAR (CMA15) for BNS-2000 Node CCM/ECPU System | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| All 3 Off | Not in service or fault<br>No power to module | Move mode switch to ENABL and restore the module.<br>Verify that module has power. |
| Green Lit | On-line, in service | |
| Yellow Lit | Off-line | Mode switch is in DISAB position; move to ENABL. Restore module. |
| Red Lit | Fault | Disable, enable, and restore the module. If fault persists, run diagnostics. |

### TABLE 6-14. Internal Tape Drive LEDs

| Internal Tape (TN2233) for BNS-2000/BNS-2000 VCS Node CCM System | | |
|---|---|---|
| **Indicator** | **Drive Status** | **Actions** |
| Green Lit | 5V OK | None |
| Yellow Lit | Reading/writing tape | None |
| Yellow Flashing Rapidly | Hardware fault or dew detected | Run diagnostics or replace board. |
| Green Lit | Cassette inserted and does not generate excess errors | None |
| Green Flashing Slowly | A cartridge is inserted but generates excessive errors beyond a predefined error threshold (*warning only*). | Use a DDS cleaning cartridge to clean the drive heads. |
| Green Flashing Slowly with Yellow LED Flashing | A prerecorded audio cartridge is inserted and is being played automatically. | Use only a DDS Tape. |
| Green Flashing Rapidly | Could not write tape | Clean tape head or replace cassette. |

### TABLE 6-15. MRCIO LEDs

| MRCIO (CTS1) for BNS-2000/BNS-2000 VCS Node CCM System | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Red Lit (Fault) | Fault | Reset the CTS1; if it does not recover, replace CTS1. |
| Green Lit (Enable) | Active | None |
| Both Lit | Active and Fault | Reset CTS1; if it does not recover, replace the CTS1. |
| Yellow Lit | Bypass mode | Move switch out of bypass. |
| SCSI Red Lit | SCSI bus fault | Pull SCSI cable and reconnect properly. If light persists, look for bent pins and replace cable. |

### TABLE 6-16. MRCM LEDs

| MRCM (TN2109C) for BNS-2000/BNS-2000 VCS Node ECPU System | | |
|---|---|---|
| **Indicator*** | **Module Status** | **Actions** |
| Red Lit | Fault | Push reset button. If still lit 60 seconds after reset, replace module. |
| Yellow Lit | Reboot | Running diagnostics and booting. |
| Green Lit | Enabled | Module has power. |
| * No two LEDs should be lit at the same time. | | |

### TABLE 6-17. Repeater LEDs

| Repeater (TN1003) for BNS-2000 VCS Node CCM/ECPU System | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Green Lit | On-line | None |
| Yellow Lit | Off-line | Put mode switch in ENABL position. |
| Red Lit | Fault | Check shelf address.<br>Disable, enable, and reset the module.<br>If fault persists, run diagnostics. |

### TABLE 6-18. RIB LEDs

| RIB (CUW1) for BNS-2000 Node CCM or ECPU System | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Green Lit | Enabled | None. |
| Red Lit | Failed | Run appropriate diagnostics or replace the module. |
| None | Disabled | Line timing is in use. |

### TABLE 6-19. SCSI/DKI LEDs

| SCSI/DKI (UN635B) for BNS-2000 VCS Node ECPU System | | |
|---|---|---|
| **Indicator** | **Module Status** | **Actions** |
| Red Lit | Diagnostic failure<br>Fault | Replace board.<br>Run **dstat cc** command. |
| Yellow Lit | Off-line | Put mode switch in ENABL position. |
| Green Lit | On-line | None |
| Green and Yellow Lit | On-line diagnostic | Mode switch in DIAG position allows access to other command modes for booting.<br>Disable, enable, and reset the module.<br>If fault persists, run diagnostics. |

The following tables show LED states for power supplies.

**TABLE 6-20. Power Supply LEDs**

| Indicator | Module or Hardware Status | Actions |
|---|---|---|
| Green and Red Off | No power or fault | Check connections. Check for blown fuse in power supply. If blown, replace power supply. |
| Green Lit | Power on | |
| Red Lit | Fault | Replace power supply.<br>The red LED may be lit if the shelf/cabinet is empty or the power supply is redundant. This does not always indicate a fault.<br>For the SAM504, not applicable when the system is powering up. The red LED is on at power up until the reset button is pressed. |
| Green and Red (alternately blinking) | Fault | Replace power supply. |

The following tables contain general information for LED indicators on most interface modules. For more specific information, see the individual module reference guide.

**NOTE:** The CPM-HS, SFT, and TRK-HS modules are special cases. In addition to the LEDs on the front of the module, these modules have a special mute light on the I/O board. If this LED is red, it indicates a broken connection between the local and remote devices.

**TABLE 6-21. LEDS on Interface Modules Residing in the Node, SAMs, and MPCs**

| Indicator | Module Status | Actions |
|---|---|---|
| All 3 Off | Not in service or fault<br>No power to module | Move mode switch to ENABL and restore the module.<br>Verify that module has power. |
| Green Lit | On-line | |
| Yellow Lit | Off-line | Mode switch is in DISAB or DIAG position; move to ENABL. |
| Red Lit | Fault | Disable, enable, and restore module.<br>Run diagnostics on the module. |

For BNS-2000 VCS nodes, the following table contains general information for LED indicators on modules in ISN concentrators. For further information, see the *ISN Concentrator Reference.*

**TABLE 6-22. LEDs on Interface Modules Residing in ISN Concentrators**

| Indicator | Module Status | Information Source |
|---|---|---|
| Both Off | No power | See ISN documentation. |
| Red Lit | Powered only.<br>Concentrator removed from service.<br>Booting (first 15 min.) | See ISN documentation. |
| Flickering green and red | Powered and link connected | See ISN documentation. |

## Additional Problem Indicators

Additional indicators include problems observed

- *on the administration console*—Problems may include the inability to access the Control Computer (**`CC0>`** prompt), or automatic reboot and automatic recovery actions by the Control Computer observed at the console. This usually indicates a problem with system power or a critical module.
- *by end users*—Network end user observations help identify the severity, scope, and location of the problem. Identifying affected end users helps locate a problem with a line, interface module, shared module (trunk or host), or critical module.
- *after installation or maintenance activity*—Recent installation or repair of modules or communication line connections may contribute to problems.

# Diagnostics

Diagnostic tests can help in locating and isolating defective modules or problems in a transmission path such as an improper connection to an I/O board. Use diagnostics when hardware is newly installed, or when hardware problems are indicated by alarm messages, status reports, or LEDs.

The *Commands Reference* gives detailed instructions for running the diagnostic commands discussed in this section. Each test for a specific module results in a system response directed to the console screen. Each module has its own message; some may recommend certain actions.

The *SMDS Guide* gives additional diagnostics for tracing the data path of connectionless traffic between SNIs, ICIs, and GARs.

If one diagnostic fails, run all other diagnostics appropriate for the module before replacing the module or I/O board. *Do not replace a module or I/O board until the faulty circuit pack has been isolated.*

## BNS-2000 Critical Module Diagnostics

Diagnostics for the Control Computer, Switching and Stratum 4 Clocking Complexes, and the CIM and CTRM affect all or most of the services provided by a BNS-2000 node. If one of these modules is malfunctioning or being newly installed, the node is assumed to be effectively out of service. Only the disk diagnostics can be executed on the standby Control Computer while the active Control Computer is operational. This is not recommended. Both Control Computers should be out of service. The "destructive" disk tests erase the contents of a disk and will require reloading the system software and node configuration data. Other tests must be run on the Control Computer to which you are connected. In monitor and loader mode, the Control Computer is necessarily out of service.

If a disk becomes unbootable, run monitor mode diagnostics; and if **`LOADER`** diagnostics are needed, boot the release tape to run these. A disk that develops bad sectors can be reformatted, and the bad sectors blocked out by using the **`LOADER`** mode disk certifier. This is a destructive procedure.

MRC diagnostics can be performed while the node is in service, but must be performed from the M port directly. Remote connections and node monitoring are not possible during these tests.

Switch diagnostics and the diagnostics for the CIM/CTRM on the Control Computer shelf also require the node to be out of service. The diagnostics for the CIM/CTRM on Port Shelves can be run from the **`CC0>`** prompt, as can the limited diagnostics for the Stratum 4 Clock (CMC3 I/O board).

Full SSM4 diagnostics are run as part of the switch loader mode diagnostics and STR4 also has its own loader diagnostics.

### PROCEDURE 6-1. Diagnostics for a Faulty Module in a BNS-2000 Node

When attempting to identify the faulty module, use the following testing sequence:

1. Controller module and disk drive diagnostics
2. SCSI/DKI module diagnostics (ECPU system only)
3. CIM and CTRM diagnostics
4. Switch module diagnostics
5. Stratum 4 Clock (**ssm4** or **str4**) diagnostics

## BNS-2000 VCS Critical Module Diagnostics

Diagnostics for the Control Computer, Clock, and Switch modules in BNS-2000 VCS nodes are performed when the Control Computer is not operational. Because these diagnostics affect service to the entire network, no new calls can be set up and existing calls are disconnected.

- Run Control Computer diagnostics by entering:
  - **di** at the **`MONITOR>`** prompt
  - **run /diag** at the **`LOADER>`** prompt
- Run Switch module diagnostics by entering **run /diag** at the **`LOADER>`** prompt.

Always run Control Computer module diagnostics *before* Switch module diagnostics, in the following order:

1. Controller module and disk diagnostics (**di** and **run /diag** commands)
2. Switch module diagnostics (**run /diag/eswitch** command)
3. DKI diagnostics (**di** and **run /diag** commands)
4. Clock diagnostics (**run /diag/clock** command)

## Monitor Mode Diagnostics

Run monitor mode diagnostics before running loader mode diagnostics. If getting to monitor mode is difficult, move the controller module mode switch from DISAB to DIAG.

The following table lists test codes and running times for monitor mode diagnostics. The running times given are for tests that pass, not tests that fail.

**TABLE 6-23. Monitor Mode Diagnostics**

| Test Name (Running Time*) | Entry at MONITOR> prompt | Notes |
|---|---|---|
| Diagnose System: CCM (approx. 2.5 min.) | di f5dd | Total of codes for all tests. CCM system only. |
| Diagnose System: ECPU (approx. 10 min.) | di f7cf | Total of codes for all tests. ECPU system only. |
| Non-destructive local RAM test (11 sec./30 sec.) | di 0001 | |
| USART test (1 sec.) | di 0002 | ECPU system only. |
| Timer test (1 sec.) | di 0004 | |
| EPROM Checksum test (1 sec.) | di 0008 | |
| Memory Management Unit (MMU) test (1 sec.) | di 0010 | CCM system only. |
| Destructive off-board RAM test | di 0010 | Factory test only. ECPU system only. |
| Non-destructive off-board RAM test | di 0020 | Factory test only. ECPU system only. |
| DKI test (1 sec.) | di 0040 | |
| Bus error and DRAM Parity test (1 sec.) | di 0080 | CCM system only. |
| SBCO30 Status Register test | di 0080 | ECPU system only. |
| Primary Disk test (3sec./12 sec.) | di 0100 | |
| Primary Tape test (2 sec.) | di 0200 | ECPU system only.** |
| Primary SCSI test (1 sec.) | di 0400 | |
| Secondary Disk test (12 sec.) | di 1000 | |
| Secondary Tape test (11 sec./2 sec.) | di 2000 | |
| Secondary SCSI test (1 sec.) | di 4000 | |
| Destructive local RAM test (1.15 min./4 min.) | di 8000 | |

* When two running times are given, the first applies to the CCM system and the second to the ECPU system.

** The CCM has only one tape drive, which is usually the secondary tape.

### PROCEDURE 6-2. Running Monitor Mode Diagnostics

**Application:** All configurations.

**Switches:** CC0: DIAG; CC1: DISAB.

**Requirements:** Set the controller mode switch to DIAG on the Control Computer being diagnosed, and to DISAB on the other Control Computer.

1. To run one test, enter the **di** command and one test code at the **MONITOR>** prompt.
2. To run multiple tests using only one command line:
   a. Add the hexadecimal test codes for the tests.
   b. Then at the **MONITOR>** prompt, enter the **di** command and the hexadecimal total.

      For example, to run the timer (0004) and the DKI (0040) tests together (0004 + 0040 = 0044), enter **di 0044**.
3. To run all tests consecutively, except the factory tests, at the **MONITOR>** prompt:

   *For a single CCM system,* enter **di e5dd**; for a dual, enter **di f5dd**.

   *For a single ECPU system,* enter **di c7cf**; for a dual, enter **di f7cf**.

---

### PROCEDURE 6-3. Recovering From Monitor Mode Diagnostic Failure

**Application:** All configurations.

**Switches:** Control Computer under test = DIAG; other Control Computer = DISAB.

1. If tests 0001 through 0008 fail, remove the CCM or ECPU module, examine the backplane for bent pins, and reseat the module. Rerun the test.
2. If tests 0001 through 0008 still fail, replace the CCM and/or the CTS1/CTS2 I/O boards; or replace the ECPU module or its AWJ15 I/O board.
3. If any of the remaining tests fail:
   a. Check the cabling and connections for the module and I/O board, then rerun the test.
   b. Remove and re-insert the module, then rerun the test.
   c. Run loader mode diagnostics.

## Loader Mode Diagnostics

When the **LOADER>** prompt is not available from the disk (for example, if the disk is faulty), load and run loader mode diagnostics from the software release tape.

### PROCEDURE 6-4. Running Loader Mode Diagnostics From Disk or Tape

**Application:** All configurations.

**Switches:** Control Computer under test: DIAG; other Control Computer: DISAB.

1. To run loader mode diagnostics from the disk:
   a. Enter the **sync** and **stop** commands to bring down the system.

      At the **LOADER>** prompt, type **dir ccm/diag** (CCM system) or **dir ecpu/diag** (ECPU system) to list the available diagnostics.

   b. Enter the command for the desired diagnostic; see the Critical Module and Control Computer Module Loader Mode Diagnostics tables that follow.

   c. *Do not loop on errors*. When prompted for looping, type **n**.

2. To run loader mode diagnostics from the tape:
   a. Move the controller mode switch to the DIAG position.

   b. Insert the release tape into the tape drive.

   c. Wait for the red or yellow LED on the tape drive to go out. Go to monitor mode.

   d. At the **MONITOR>** prompt,

      *for the CCM system*, enter **boot st/3**.

      *for the ECPU system*, enter **boot t**.

   e. When the **LOADER>** prompt appears, enter the command for the desired diagnostic.

   f. *Do not loop on errors*. When prompted for looping, type **n**.

The following two tables list the tests and running times for Control Computer modules and Switch module; and for BNS-2000 nodes, CIM and CTRM loader mode diagnostics. Running times are for tests that pass, not tests that fail.

**TABLE 6-24. Loader Mode Diagnostics for the CCM System**

| Module/Test Name (Running Time) | Entry at LOADER> prompt | Explanation |
|---|---|---|
| CCM/MMU (2 to 5 sec.) | run /diag/mmu | Includes the following tests: write ECPU point register, write supervisor root pointer register, supervisor/user/write protections, invalid descriptor type read, invalid descriptor type write, used bit, modified and used bit, on-board bus timeout read, on-board bus timeout write, off-board bus timeout read, and off-board bus timeout write. |
| CCM/timer (10 sec.) | run /diag/timer | Uses the timer and timer interrupt tests to test the five timers in the Control Computer. |
| CCM/time of day (1.5 min.) | run /diag/tod | Used to set and display system time, or run functionality test on time-of-day clock. |
| CCM/DRAM (35 min.) | run /diag/dram | A menu of commands and options appears.<br>Includes the following tests: address degeneracy, data degeneracy, data retention, refresh activity, parity, opcodes, DMA, burst mode parity, status register, and mini-test (data, parity, and DMA). |
| CCM disk/Tape (8 min. for disk; approx. 5 hrs. for tape) | run /diag/disk | A menu for the following tests appears: drive access, drive internal, SCSI bus reset, read disk, write (destructive test), interrupt. |
| CCM/DKI (1.5 min.) | run /diag/dki | A menu for the following tests appears: control registers and basic access, basic transmit/receive, software status word (active CC only), interrupt, miscellaneous FIFO, FIFO status, Switch module rest (active CC only), fast transfer, extended channel bits (active CC only), reset button. |

### TABLE 6-25. Loader Mode Diagnostics for the ECPU System

| Module/Test Name (Running Time) | Entry at LOADER> prompt | Explanation |
|---|---|---|
| ECPU/instructions (5 sec.) | run /diag/mc68030 | Verifies: data movement, program control, integer arithmetic, logical arithmetic, shifting/rotating bits, bit manipulation, BCD arithmetic, system control, bit fields, instruction caches, and data caches.<br>When an error is detected, the test quits and does not check other areas. |
| ECPU/MMU (15 sec.) | run /diag/mmu | Includes the following tests: write ECPU point register, write supervisor root pointer register, supervisor/user/write protections, invalid descriptor type read, invalid descriptor type write, used bit, modified and used bit, on-board bus timeout read, on-board bus timeout write, off-board bus timeout read, and off-board bus timeout write. |
| ECPU/timer (1 min.) | run /diag/timer | Uses the timer and timer interrupt tests to test the five timers in the Control Computer. |
| ECPU/time of day (1.5 min.) | run /diag/tod | Used to set and display system time, or run functionality test on time-of-day clock. |
| ECPU/DRAM (60 min.) | run /diag/dram | A menu of commands and options appears.<br>Includes the following tests: address degeneracy, data degeneracy, data retention, refresh activity, parity, opcodes, DMA, burst mode parity, status register, and mini-test (data, parity, and DMA). |
| Disk/Tape Subsystem (8 min. for disk; approx. 5 hrs. for tape) | run /diag/disk | A menu for the following tests appears: drive access, drive internal, SCSI bus reset, read disk, write (destructive test), interrupt. |
| SCSI/DKI (20 min.) | run /diag/dki | A menu for the following tests appears: control registers and basic access, basic transmit/receive, software status word (active CC only), interrupt, miscellaneous FIFO, FIFO status, Switch module rest (active CC only), fast transfer, extended channel bits (active CC only), reset button. |

### TABLE 6-26. Critical Module Loader Mode Diagnostics for the CCM and ECPU Systems

| Module/Test Name (Running Time) | Entry at LOADER> prompt | Explanation |
|---|---|---|
| CIM and CTRM (20 sec.) | run /diag/ctrm_cim | A menu for the following tests appears: local CTRM, CTRM I/O board external CTRM, fiber link, CIM I/O board, remote CIM. This diagnostic is run only for CTRMs located in Control Shelves. |
| Clock (1.5 min.) | run /diag/clock | The Clock and Repeater modules are tested with this diagnostic. It includes tests to analyze status packets, hardware and software status polling, phantom shelves, reset circuitry, and status monitor circuits. |
| Switch (30 min.) | run /diag/switch | Regardless of the switching complex in use, a menu for the following tests appears: self-test, RAM control memory, setting ROM/RAM mode, command channel selection, DISAB/ENABL commands, switch/node RESET commands, CLEAR/READ/WRITE BWM RAM commands, parity over switch memory, channel number out-of-range or mask error detector, per-module word count roll-over error detector, per-channel segment count roll-over error detector, module and channel number capture and priority circuit, status poll responses from the disabled Switch, shadowing function of disabled Switch, extension shelves control, clock control for the Stratum 4 Clock (CMC3 I/O board) and light test. |
| STR4 | run /diag/str4 | The user is prompted for the Stratum 4 Clock configuration information (CTG13/CNA7 board) and a menu for the following tests appear: Enable/Disable SYNC Unit Commands, Switchover SYNC Unit Commands, Free Run and Holdover, and Reference Switchover and Reversion. |

### PROCEDURE 6-5. Recovering From Loader Mode Diagnostic Failure

**Application:** All configurations.

**Switches:** CC0: DIAG; CC1: DISAB.

1. If a test fails, check the cabling and connections to the module and I/O board. Inspect the backplane for bent pins.
2. If a cabling or connection problem exists, correct it and rerun the test.
3. If the test still fails, replace the module. Rerun the test to verify that the problem has been resolved.
4. If the test still fails, remove modules and I/O boards. Re-insert them, one at a time, and run the tests again.
5. If the test still fails, replace modules, I/O boards, or cables.

## Stratum 4 Clock (CMA1/CNA1/CMC3 Boards) Diagnostics

When the Stratum 4 Clock has been configured, the **diagnose ssm4** command provides a self-test for the primary and secondary clocks on the Stratum 4 Clock (SSM4). The self-test reports the condition of the Stratum 4 Clock hardware as **PASS** or **FAIL** .

### PROCEDURE 6-6. Running SSM4 Diagnostics

**Application:** All BNS-2000 configurations that have from one to three Series M2 Extension Shelves and are configured with the CMA1/CNA1/CMC3 Switch/Clock complex.

1. Enter **diagnose ssm4**.

   This diagnostic reports the primary and secondary timing reference source and the state of the reference source as follows.

| SSM4 Primary and Secondary Timing Reference Sources | |
|---|---|
| **Status** | **Explanation** |
| **OK** | No problem exists with the primary or secondary clock |
| **LOS** | Loss of signal from the primary or secondary clock |
| **unknown** | Source clock is unknown |
| **AIS** | Alarm indication signal |
| **NA** | The primary or secondary clock is improperly configured or does not appear in the database |

2. If the test fails, enter **restore ssm4** to return the clock to service.
3. If this restore fails, replace the Stratum 4 Clock I/O board (CMC3).

The *Commands Reference* gives more information on running the **diagnose ssm4** command.

## Extended Stratum 4 Clock (CTG13/CNA7 Boards) Diagnostics

When the Extended Stratum 4 Clock (STR4) is configured and removed from service, the **diagnose str4** command can initiate an on-line selftest for the Stratum 4 Clock, which checks the ability of the STR4 to generate accurate timing from the external reference source circuitry.

### PROCEDURE 6-7. Running STR4 Diagnostics

**Application:** All BNS-2000 configurations that have up to five Series M2 Extension Shelves and are configured with the Extended Switch/Clock complex.

1. Enter **diagnose str4**.

   This diagnostic output gives information about the external primary and secondary timing reference source as follows.

| STR4 External Primary and Secondary Reference Source | | |
|---|---|---|
| **Status** | **Reference Source** | **Explanation** |
| **AIS** | External | Alarm indication signal (for T1 only). |
| **LOS** | Internal or External | Loss of signal from the primary or secondary clock. |
| **NA** | Internal | The primary or secondary clock is improperly configured or does not exist in the database. |
| **OK** | Internal | The primary or secondary clock are functioning properly. |
| | External | RIBs are functioning properly. |
| **OOF** | External | Out-of-frame (for T1 only). |
| **unknown** | Internal or External | The source clock is unknown. |

2. Enter **restore str4** to return the clock to service.
3. If this restore command fails, replace the STR4 board.

The *Data Networking Products Commands Reference* gives more information on running the **diagnose str4** command.

## MRCIO Board Diagnostics

Two types of diagnostics are available for the MRCIO board: internal and interface diagnostics.

Internal diagnostics are run when the MRC is in service. Connections to the A and B ports are maintained by the bypass circuit during the tests. While the diagnostics are executing, the MRC suspends node monitoring and remote access services.

Interface diagnostics are run when the MRC is in service. The tests interact with firmware on the Control Computer and expect a dual Control Computer node. The Control Computers must be at the **MONITOR>** prompt, with the mode switch in DIAG. In addition, the boards must be initialized by being reseated to set the baud rates correctly on ports A and B.

MRC diagnostics must be performed from a console connected directly to port M on the I/O board. For BNS-2000 nodes, any connection between port M and the node or a modem, or any remote connection to port M is dropped during MRC diagnostics. Connections to the Control Computer's ports A and B are dropped when running diagnostics.

---

### PROCEDURE 6-8. Running MRCIO Diagnostics

1. *To run internal diagnostics:*
   a. At the **MRC>** prompt, enter **diagnose internal**.
   b. To determine the last diagnostic failure recorded for the MRC during execution of the **diagnose internal** command, enter **display diagnostic**.
   c. If the **diagnose internal** command fails, replace the CTS1; see the procedure in this chapter for replacing a CTS1.

2. *To run interface diagnostics:*
   a. Remove the standby Control Computer from service by entering the **remove standby** command.

      **NOTE:** This test can be run with a single controller, but some tests will fail because they depend on the second controller. The tests that will fail are the Reset CC0, and all tests for CC1.

   b. Disable the automatic recovery feature by entering the **set recovery off** command.
   c. Attach loopback connectors to A and B ports; see the following table.

**PROCEDURE 6-8. Running MRCIO Diagnostics** (continued)

| Loopback Connectors for MRC Interface Diagnostics | |
|---|---|
| **MRC Port** | **Identification** |
| A | ED5P055-31, G211 |
| B | ED5P055-31, G212 |

If these connectors are not available, see the following figures. Figure 6-1 shows how to modify one end of an 8-conductor modular plug (top) and the plug's wiring scheme (bottom).

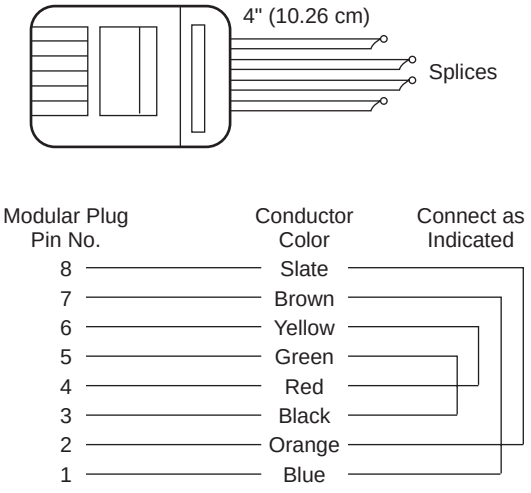


**FIGURE 6-1. Loopback Connector for Use With a Modular Jack**

**PROCEDURE 6-8. Running MRCIO Diagnostics** (continued)

The following figure shows how to modify one end of a 4-pair 110 patch panel patchcord (top) and the patchcord's wiring scheme (bottom).

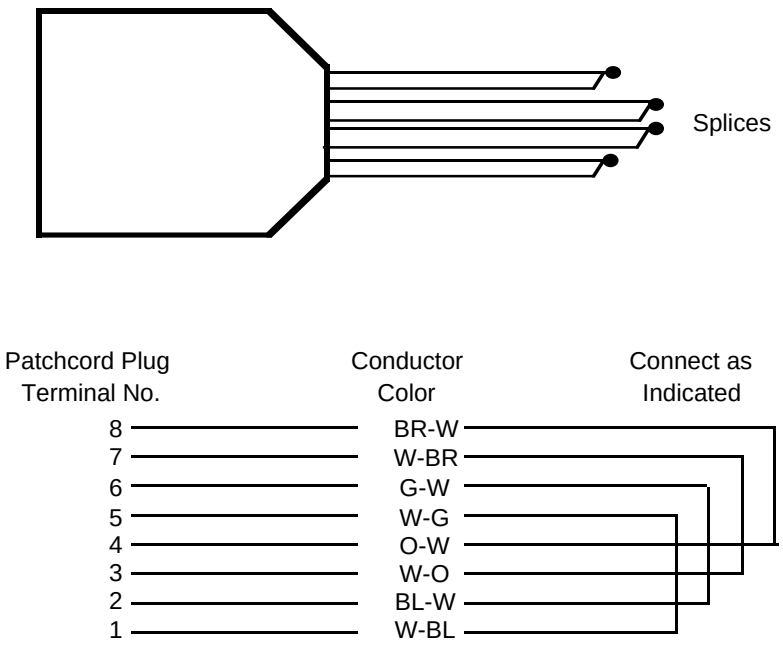


**FIGURE 6-2. Loopback Connector for Use at a 110 Patch Panel**

**PROCEDURE 6-8. Running MRCIO Diagnostics** (continued)

d. Bring both Control Computers down to the **`MONITOR>`** prompt.
   Put the controller mode switch in the DISAB position on CC0 and CC1.

e. Reseat both controllers: remove CC1 and then CC0.
   Insert CC0, and then CC1 to minimize CTS1 resets.

f. Put the controller mode switch in the DIAG position.
   The CTS1 will reset when CC0 is inserted, if this procedure is followed.

g. At the **`MRC>`** prompt, enter **diagnose io**.

h. If the **diagnose io** command fails, check the loopback connectors.

i. If the **diagnose io** command still fails, replace the MRC.

## MRCM Diagnostics

Two types of diagnostics are available for the MRCM: internal and interface diagnostics. Diagnostics are run when the MRCM is in service. While the diagnostics are executing, the MRCM suspends node monitoring and remote access services.

MRCM diagnostics must be performed from a console connected directly to port M on the AWJ16B I/O board. For BNS-2000 nodes only, any connection between port M and the node or a modem, or any remote connection to port M is dropped during MRCM diagnostics. Connections to the AWJ15 I/O board ports A and B are dropped when running diagnostics. If it is necessary to maintain console connections, detach the console connector from the MRCM AWJ16B I/O board port A and connect it directly to the active Control Computer AWJ15 I/O board port A.

### PROCEDURE 6-9. Running MRCM Diagnostics

1. *To run internal diagnostics:*
   a. At the **`MRCM>`** prompt, enter **diagnose internal**.
   b. To determine the last diagnostic failure recorded for the MRCM during execution of the **diagnose internal** command, enter **display diagnostic**.
   c. If the **diagnose internal** command fails, replace the MRCM.
2. *To run interface diagnostics:*
   a. Remove the standby Control Computer from service by entering the **remove standby** command.
   b. Disable the automatic recovery feature by entering the **set recovery off** command.
   c. Attach loopback connectors to all ports except port M; see the following table.

**Loopback Connectors for MRCM Interface Diagnostics**

| MRCM Port | Identification |
|---|---|
| A | ED5P055-31, G211 |
| B | ED5P055-31, G212 |
| R0 | ED5P055-31, G213 |
| R1 | ED5P055-31, G213 |
| A0 | ED5P055-31, G214 |
| A1 | ED5P055-31, G214 |
| B0 | ED5P055-31, G214 |
| B1 | ED5P055-31, G214 |

**PROCEDURE 6-9. Running MRCM Diagnostics** (continued)

If these connectors are not available, see the previous figures to modify one end of an 8-conductor modular plug (top) and the plug's wiring scheme (bottom); and to modify one end of a 4-pair 110 patch panel patchcord (top) and the patchcord's wiring scheme (bottom).

d. At the **`MRCM>`** prompt, enter **diagnose io**.

e. If the **diagnose io** command fails, check the loopback connectors.

f. If the **diagnose io** command still fails, replace the MRCM and its I/O boards.

## Shelf, Interface Module, and Trunk Module Diagnostics

Interface module, shelf, and trunk module diagnostics are run by entering the **diagnose** command at the **`CC0>`** or **`CC1>`** prompt. The module diagnostics affect service only on the module or port being diagnosed. The *Commands Reference* gives more information on the **diagnose** command. The shelf diagnostics, which are used only for BNS-2000 nodes, affect service for all modules on the shelf.

These diagnostics are either tests run on the module hardware or loopback tests that isolate problems in a transmission path to a replaceable unit, such as a module or cable.

A loopback test works as follows:

1. The **diagnose** command (for example, **diagnose trunk**) sends a test pattern from the local Control Computer over a path (or circuit) to a designated endpoint such as a data service unit (DSU) or a host computer, and back to the Control Computer.
2. When the test pattern returns to the local Control Computer, the Control Computer checks to see if it matches the pattern sent:
   - If the test pattern matches, the path is most likely operating properly.
   - If the test pattern does not match, there is a problem in the path.
3. Loopback tests are continued on increasingly larger portions of the transmission path; a test failure indicates that the trouble is somewhere in the portion of the path tested.

To run an on-line test, the module must be in service and the port being tested must be out of service.

To run an off-line test, the module must be out of service.

Some modules require special loopback connectors to run diagnostics; see the appropriate module reference guide.

# Data Gathering Guidelines

The procedures and diagnostics contained in this chapter should be performed before placing a call for assistance. (See the **Technical Assistance** preface for telephone numbers.)

### TABLE 6-27. Troubleshooting Data Procedures Checklist

| √ | Problem Area | Information Source |
|---|---|---|
| | Data transport | Procedure 6-10 |
| | Redundancy | Procedure 6-11 |
| | Trunking | Procedure 6-12 |
| | Operations, administration, and maintenance | Procedure 6-13 |
| | Rebooting | Procedure 6-14 |
| | Diagnostics | Procedure 6-15 |
| | Call processing | Procedure 6-16 |

### PROCEDURE 6-10. Collecting Data Transport Data

1. Collect information at the console using the following commands:

   **verify module** <*address*>
   **display connections module** <*address*>
   **display traffic module** <*address*> (BNS-2000 nodes only)
   **dmeas** <*object*> <*address*>
   **dstat module** <*address*> **high**

2. Record the identifying numbers and manufacturer of the equipment in the path from the interface module to the connected device.

   For example, note the series number and the barcode serial number of the circuit pack and the model of the I/O board; and describe the cables, cable adapters, and endpoint device.

3. Obtain the state of the EIA leads, if possible, by using the **display eia** command (for MSMs, SAMs, and TYs) or the **dstat** command (for synchronous modules), or by using a breakout box.

4. Estimate the actual throughput in bits per second per module/per port.

5. Obtain a log of any protocol trace, if taken, and any actions taken by other service providers investigating this problem.

6. If the circuit spans more than one node, see the procedure for Collecting Trunking Data.

### PROCEDURE 6-11. Collecting Redundancy Data

1. Collect all console data and alarms output from both Control Computers when the trouble occurred.
2. Determine if the standby Control Computer failed after the automatic switchover.
3. Collect information at the console by using the **dstat cc** and **dstat module** <*address*> **high** commands.
4. Collect alarm messages, and data from the console connected to port M on the MRC with the **display status** command.
5. Determine the sequence of actions leading up to the trouble.
6. Describe the hardware configuration (including the terminals and workstations used for the console or remote console).
7. Run the diagnostics suggested by alarm messages on the standby Control Computer.

---

### PROCEDURE 6-12. Collecting Trunking Data

1. For each node between the endpoints, collect information at the console by using the following commands:

   **verify module** <*address*>
   **verify node**
   **dstat module** <*address*> **high**
   **display connections module** <*address*>
   **display traffic module** <*address*> (BNS-2000 nodes only)
   **dmeas** <*object*> <*address*>

2. Obtain copies of the scheduled administrative measurements reports.
3. Record the type of trunk, trunk speed and connection type (node or concentrator).
4. Record the identifying numbers and manufacturer of the equipment in the path from the interface module to the facility.

   For example, note the series number and the barcode serial number of the module and the model of the I/O board, and describe the cables, cable adapters, and DSU, modem, CSU, or multiplexer.

5. If possible, describe the endpoints generating the trunk traffic: asynchronous or synchronous, bursty or sustained traffic, speed of the access lines, and so forth.

### PROCEDURE 6-13. Collecting Operations, Administration, and Maintenance Data

1. Collect alarms, reports (scheduled and administrative), information on end user command mode (attention session) and billing by using the **dmeas**, **dstat**, and **display** commands.
2. Collect information at the console by using the **verify** command on all related components.
3. If the problem involves command mode, include output from the user terminal.
4. If the problem involves removing or restoring a module with the **remove/restore** commands, include a hardware description and the database configuration of the module.
5. If the problem involves accuracy of the measurements, see the procedure for Collecting Data Transport Data.
6. If *StarKeeper* II NMS is monitoring the node, obtain the console log stored in the *$CONSLOG* directory.

---

### PROCEDURE 6-14. Collecting Rebooting Data

1. Collect any console output and alarms.
2. If the MRC feature is involved, see the procedure for Collecting Redundancy Data.
3. Report the node hardware configuration (single or dual disk system), mode switch positions, and LED states.
4. Report the node software release or generic, and build number in use.
5. Determine the sequence of actions leading to the problem.

---

### PROCEDURE 6-15. Collecting Diagnostics Data

1. For the **diagnose** <*module/port*> command:
   a. Determine whether the problem was in the administrative interface; if the diagnostic failed to report an error; or if the diagnostic reported an error when none occurred.
   b. If the diagnostic failed to report an error, determine the type of error or the condition for which a diagnostic was run.
   c. Collect information at the console by using the following commands:

      **verify module** <*address*>
      **dstat module** <*address*> **high**
      **dmeas** <*object*> <*address*>

**PROCEDURE 6-15. Collecting Diagnostics Data** (continued)

d. For all diagnostics, report the identifying numbers and manufacturer of the equipment in the path from the interface module to the connected device.

   For example, note the series number and the barcode serial number of the module and model of the I/O board and describe the cables, cable adapters, modems, endpoint device, etc.

2. If the command was either **di** (in monitor mode) or **run /diag/**<*test name*> (in loader mode), obtain and report the console output log.
3. If *StarKeeper* II NMS is monitoring the node, obtain the console log stored in the *$CONSLOG* directory.

---

**PROCEDURE 6-16. Collecting Call Processing Data**

1. For each module in the path between the endpoints involved in the trouble, collect information at the console by using the following commands:

   **verify module** <*address*>
   **display connections module** <*address*>
   **display traffic module** <*address*> (BNS-2000 nodes only)
   **dstat module** <*address*> **high**
   **display circuits** <*address.channel*>

2. Report the identifying numbers and manufacturer of the equipment in the path from the interface module to the connected device.

   For example, note the series number and the barcode serial number of the module and the model of the I/O board, and describe the cable, cable adapters, and endpoint device.
3. Report the state of EIA leads, if possible.
4. If the virtual circuit spans nodes, include a description of the remote node.
5. Estimate the call processing load on the Control Computer and module.
6. Report how the call attempt was made; for example, PDD call setup, cable disconnect.
7. Report any end user terminal messages.
8. Obtain the log of a protocol trace, if available.

## Problem Areas

This section discusses the following problem areas:

- power problems, including
  - fan failure
  - Series M2 shelf fuses
  - Series M1 shelf fuses
- Control Computer problems, including
  - system lockup
  - booting problems
  - module recognition and restoration problems
  - disk/tape file system and access problems
  - MRC and dual Control Computer problems
  - console problems
- Switch module (BNS-2000 and BNS-2000 VCS) problems
- CIM and CTRM problems (BNS-2000)
- GAR problems (BNS-2000)
- end user problems, including
  - inability to connect
  - modem pool problems

The following table lists the symptoms and indicators that help point to likely problem areas.

## TABLE 6-28. Problem Areas and Related Symptoms Checklist

| √ | Problem Area | Symptoms and Indicators | Information Source |
|---|---|---|---|
| | Power problem | No power to a module or shelf<br>No power to any shelf | See appropriate tables in this chapter giving LED information. See Table 6-29. |
| | Disk or tape problem | Difficulty accessing disk or tape drives<br>Green LED (on drive) is off<br>Green LED (on drive) is on and yellow LED (CCM system) or red LED (ECPU system) is off | See appropriate tables in this chapter giving LED and diagnostics information; and see Table 6-32. |
| | Control Computer or MRC problem | System locked up or not functioning<br>No new calls can be made on node<br>All calls on node disconnected<br>Red or Yellow LED lit on Control Computer module<br>Control Computer constantly rebooting<br>Console cannot access Control Computer or MRC<br>Standby Control Computer switchover failed | See appropriate tables in this chapter giving LED and diagnostics information. See Tables 6-31, 6-33. |
| | CTG13 Switch (integrated Stratum 4), RIB, CIM, or CTRM problem on BNS-2000 nodes | Red LED lit on RIB<br>Automatic CTG13 Switch switchover alarm<br>Red or Yellow LED lit on CTG13 Switch, CIM, or CTRM<br>AI-T1 module test fails<br>Alarms show LOS or AIS | See appropriate tables in this chapter giving LED and diagnostics information. See Table 6-34. |
| | CMA1 Switch, Stratum 4 Clock, CIM, or CTRM problem on BNS-2000 nodes | Automatic CMA1 Switch switchover alarm<br>Red or Yellow LED lit on CMA1 Switch, CIM, or CTRM<br>AI-T1 module test fails<br>Alarms show LOS or AIS | See appropriate tables in this chapter giving LED and diagnostics information. See Table 6-34. |
| | TN2099 Eswitch problem on BNS-2000 VCS nodes | Automatic Switch switchover alarm<br>Red or Yellow LED lit on Switch module | See Table 6-11. |

**TABLE 6-28. Problem Areas and Related Symptoms Checklist** (continued)

| √ | Problem Area | Symptoms and Indicators | Information Source |
|---|---|---|---|
| | Concentrator problem | No calls in progress or cannot make calls to MPC<br>End users on concentrator report data loss or error<br>Link modules out of service<br>Red LED lit on link module to concentrator | See appropriate tables in this chapter LED information and the *Multipurpose Concentrator Reference* |
| | Asynchronous service problem | No calls in progress or cannot make calls<br>MSM, SAM, or TY end users unable to communicate to node host<br>Red LED lit on MSM, SAM, or TY module<br>MSM, SAM, or TY end users report lost or garbled data | See appropriate tables in this chapter giving LED information and the *Multispeed Module Reference*, *Synchronous/ Asynchronous Multiplexer Reference*, or *TY Module Reference* |
| | End user problem | Difficulty in connecting to node or another end user<br>Difficulty after connecting | See Tables 6-36 and 6-37. |
| | Synchronous service problem | Module will not download or restore<br>Link does not come up<br>Experiencing call setup problems | *Transparent Synchronous Module Reference* and *Synchronous Data Link Control Module Reference* |
| | X.25 service problem | Red LED lit on X.25 module<br>No calls in progress (PDD not set up) | *X.25 and X.25P Module Reference* |
| | X.25P service problem | Red LED lit on X.25P module | *X.25 and X.25P Module Reference* |
| | X.75 service problem | Red LED lit on X.75 module | *X.75 Module Reference* |

**TABLE 6-28. Problem Areas and Related Symptoms Checklist** (continued)

| √ | Problem Area | Symptoms and Indicators | Information Source |
|---|---|---|---|
| | AI service problem (BNS-2000 nodes) | AI-connected module, port, or trunk cannot communicate | *Access Interface Module Reference* |
| | GAR problem (BNS-2000 nodes) | Restore fails<br>Red LED lit<br>**dstat** shows incorrect actual states<br>No group address resolution | See Table 6-13, 6-35, *Node Reference*, and *SMDS Guide*. |
| | Frame Relay service problem | Module will not download or restore<br>Link does not come up<br>Experiencing call setup problems | *Frame Relay Module Reference* |
| | Networking service problem | No calls in progress or cannot make calls over trunk<br>End users on trunk report data loss or slow response<br>Red LED lit on trunk module | *Trunk Module Reference*, *M2 Trunk Module Reference*, and *SMDS Guide* |
| | Multiplexed host interface problem | No calls in progress to host<br>End users to host report data loss<br>Host not answering after restore of CPM | *Computer Port Module Reference* |
| | LAN interconnect or LAN Communications Systems (LCS) problem | LAN-connected module or ports do not communicate | LCS documentation, *LPM Reference*, and *FRM Reference* |

The sections for each problem area contain more specific tables that describe appropriate actions and procedures needed for problem resolution.

## Power Problems

The **dstat node** command gives a general overview of the node power, fans, and temperature conditions.

**TABLE 6-29. Power: General Problems Checklist**

| √ | Symptoms and Indicators | Possible Causes | Actions/Information Source |
|---|---|---|---|
| ____ | No power to a module | Faulty modules | Replace the module. |
| ____ | Slow response on node | Blown or missing fuse | See the Procedure for Checking and Changing Series M2 Shelf Fuses or Checking and Changing Series M1 Shelf Fuses. |
| ____ | Report alarm message | | |
| ____ | No power to shelf | Shelf not receiving power | See the procedures for Testing the Power in a Base Power Unit, Performing Voltage Checks for Series M2 Shelves, or Performing Voltage Checks for Series M1 Shelves. |
| ____ | Power out of range | Circuit breaker for shelf OFF | Insert a module. |
| ____ | Node down | No drain on power supply | Replace power supply or supplies. |
| ____ | Contactor buzzes when power on | Power supply failure | Check power connections; see **Node Installation** chapter. |
| ____ | Breakers tripped on Base Power Unit | Improper connection | Verify that power supplies are properly seated. |
| ____ | No LEDs lit on power supply | | Verify that circuit breaker on base (or top, in CO frame) is turned on. |
| ____ | Red LED lit on power supply | | |
| | Red and green LED lit on power supply | | |
| ____ | BNS-2000 node fans not running | Faulty fan, fan cable, or ASP7B I/O board | Check fan cable connection to ASP7B I/O board. See the Procedure for Replacing the Fan Tray in a Series M2 Shelf or Replacing the Fan Tray in a Series M1 Shelf. |
| ____ | BNS-2000 VCS node: fan alarm sounds when fans are running. | Faulty fan, fan cable, faulty ASP1 I/O board, faulty Clock or Repeater module. | Check fan cable to ASP1 I/O board. |

### PROCEDURE 6-17. Testing the Power in a Base Power Unit

**Application:** BNS-2000 and BNS-2000 VCS nodes with a Base Power Unit.

1. For BNS-2000 nodes, set the mode switches on the CIMs (in the Series M2 Switch Shelf) and CTRMs (Series M1 shelves) to DISAB.
2. For BNS-2000 nodes, verify that the fan cable is connected to the ASP7B I/O board (Series M1 shelves).
3. For BNS-2000 VCS nodes, verify that the fan cable is connected to the ASP1 I/O board.
4. Verify that the building power supply circuit is turned on.
5. Verify that all fuses in each shelf are functional. There are two fuse modules in each Series M1 shelf and one fuse panel in each Series M2 shelf.
6. Turn ON the individual shelf circuit breakers located on the rear door of the Base Power Unit.
7. Check that all fans are running. If the green LEDs on the power supplies are lit, the power supplies and Base Power Unit are working properly. If the power is on and the fans are not running, see the procedure provided in this chapter for replacing the fan trays.

---

### PROCEDURE 6-18. Performing Voltage Checks for BNS-2000 Series M2 Shelves

**Application:** All BNS-2000 Series M2 Shelves.

1. Remove a module from a Series M2 shelf slot.
2. Open the fuse panel and place one lead of a voltmeter on the fuse contact for the shelf slot from which the module was removed. (Remove the fuse, if necessary.)
3. Place the other lead of the voltmeter on the grounding jack on the front of the shelf.
4. Measure the voltage. The voltage should measure 5.15–5.35 VDC.
5. Locate the two guide pins (large pins) on the backplane connector for the slot from which the module was removed. Place a lead from the voltmeter on each of the guide pins.
6. Measure the voltage. The voltage should measure 5.15–5.35 VDC. If the voltage is not within this range, call 1-800-WE-2-CARE.

### PROCEDURE 6-19. Performing Voltage Checks for Series M1 Shelves

**Application:** All Series M1 Shelves.

**Requirements:** Slots should be empty when the slot voltages are checked.

**NOTE:** The system has a power monitor circuit that prevents the Control Computer from starting, if the 5 VDC power level is not in the allowed range.

1. Place one lead of the voltmeter on the mounting rails for the I/O boards as the common probe point.
2. Place the other lead of the voltmeter on the backplane points behind the third power supply slot (marked *056* on the rear of the backplane, to the left of the fuse modules).

   The following table shows appropriate voltage ranges and measurement points; the following figure gives the pin locations.

### TABLE 6-30. Voltage Range and Measurement Points for Series M1 Shelf Power Supply Slots

| Position 056 | |
|---|---|
| **Pin Number** | **Voltage Range** |
| 056 | 5.15 to 5.35 VDC |
| 032 | 0 V (ground) |
| 024 | 11.4 to 12.6 VDC |
| 021 | -10.8 to -13.2 VDC |

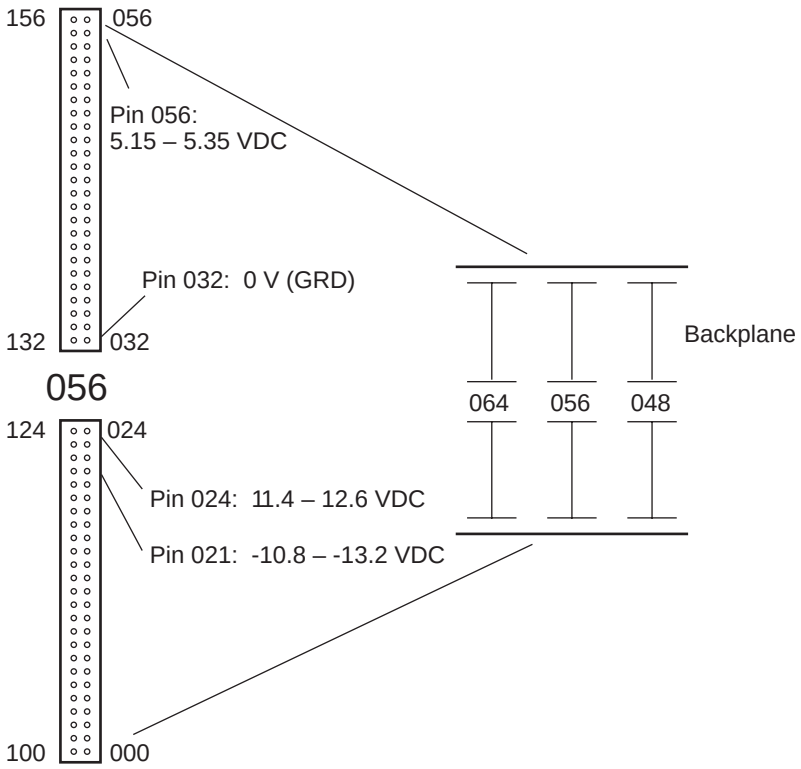


**FIGURE 6-3. Rear View of Voltage Check Points for Series M1 Power Supply Slots**

3. Check the module slot voltages using a voltmeter on the lower backplane and pin fields behind each slot.
4. If the voltage is not within the appropriate range, call 1-800-WE-2-CARE; see the **Technical Assistance** preface.

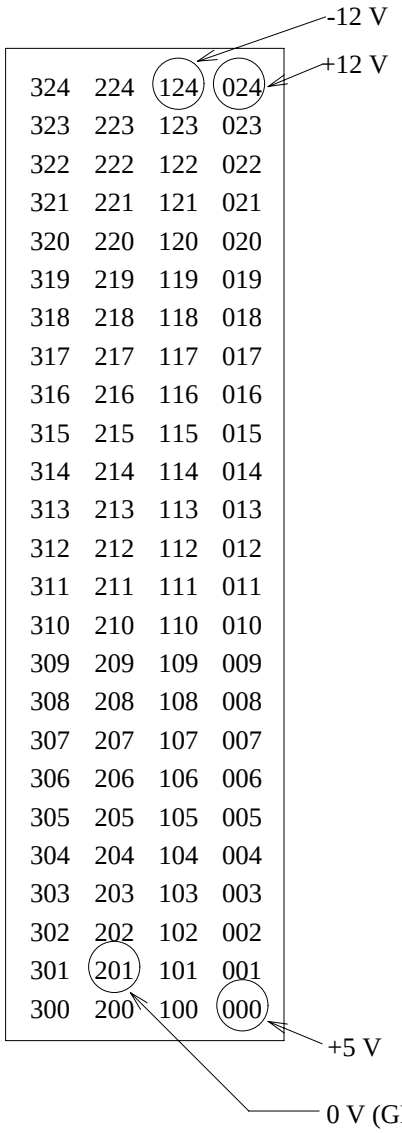


**FIGURE 6-4. Terminal Pin Assignments for Module Slots in Series M1 Shelves**

### PROCEDURE 6-20. Replacing the Fan Tray in a Series M2 Shelf

**Application:** All Series M2 Shelves.

A fan failure is indicated when the fan (located to the right of the slots on each Series M2 shelf) is not working at all, or is not revolving at the correct speed. When a fan fails, replace the entire fan tray.

1. Loosen the two screws on the fan tray and pull the fan tray out.
2. Insert the new fan tray and push it gently until it connects with the fan power source connector on the backplane.

   When the fan tray is locked into position, the fans start automatically.
3. Tighten the screws on the fan tray.

---

### PROCEDURE 6-21. Replacing the Fan Tray in a Series M1 Shelf

**Application:** All node cabinets.

A fan failure is indicated when the fan (located at the bottom of each cabinet) is not working at all, or is not revolving at the correct speed. When a fan fails, replace the entire fan tray.

1. Loosen the five screws along the fan tray front cover.
2. With the cords for the power supplies still attached, rotate the front cover up and out of the way.
3. Loosen the four screws attached to the shelf, along the top of the fan tray, and pull the fan tray out.
4. Insert the new fan tray and push it gently until it connects with the fan power source connector on the backplane. When the fan tray is locked into position, the fans start automatically.
5. Tighten the four screws on the new fan tray.
6. Replace the fan tray cover and tighten the screws.

### PROCEDURE 6-22. Checking and Changing Series M2 Shelf Fuses

**Application:** All Series M2 Shelves.

Each Series M2 shelf has 15 fuses (F1–F15). The fuses are located inside a fuse panel on the front of the shelf between the power supplies.

**NOTE:** The fuse for the backplane terminators in slot F15 must be present for the node to operate correctly.

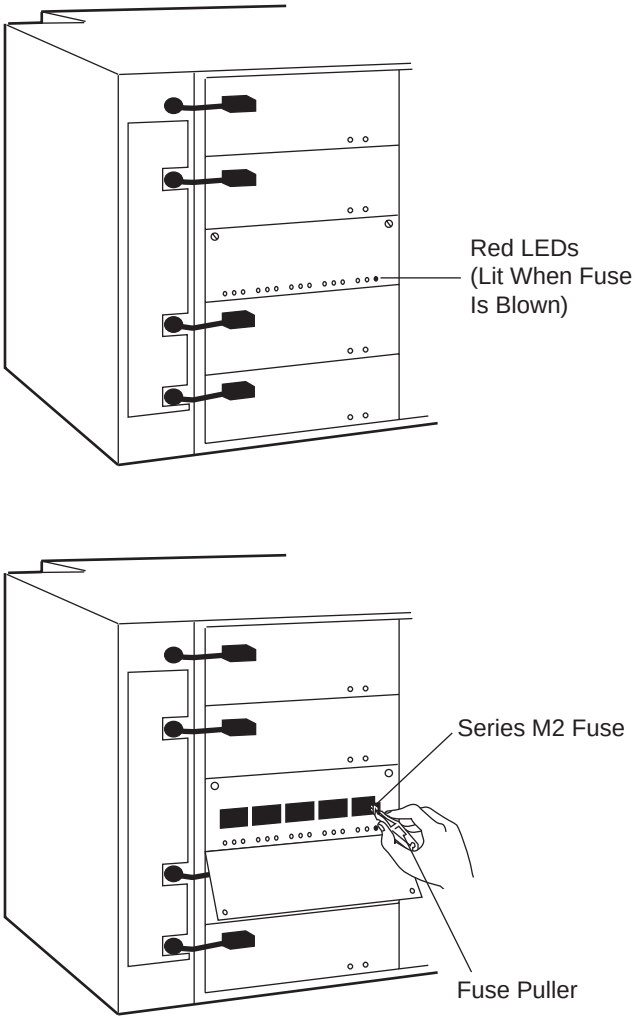


**FIGURE 6-5. Checking and Changing a Series M2 Shelf Fuse**

**PROCEDURE 6-22. Checking and Changing Series M2 Shelf Fuses** (continued)

1. Locate the lit LED on the fuse panel. The fuse panel has a LED for each fuse that lights when its corresponding fuse has blown.
2. Loosen the screws on the top of the panel and pull the fuse panel door down.
3. Use the fuse puller to remove the old fuse and insert a new fuse.
4. Close the fuse panel door and insert and tighten the screws.
5. Isolate and correct the condition causing the fuse failure:
    a. Remove the module, insert a new fuse, and then re-insert the modules.
    b. If the fuse blows again, replace the module.
    c. If the fuse blows after module replacement, replace the I/O board.

---

**PROCEDURE 6-23. Checking and Changing BNS-2000 Series M1 Shelf Fuses**

**Application:** All Series M1 Shelves.

Each Series M1 shelf contains two fuse modules (ASP2) located on the wiring side of the backplane between power supplies 0 and 1. Each fuse module contains nine fuses, for a total of 18 per shelf. There is one fuse for each module slot and two spare fuses, one fuse for position E3, for the ARU, and one fuse for position E5. When a fuse is blown, a wire breaks and a flag pops up and is visible through the clear plastic top.

**NOTE:** If a node is experiencing a slow response, check the fuse for the backplane terminators in slot 0 of the Control Shelf. When this fuse is missing or blown, the shelf will run incorrectly. A fuse must be present in slot 0 (the lowest slot) of each shelf.

1. Look for the flag at the top of the fuse. If no flag is visible, the fuse is intact. If a flag is visible, the fuse is blown.

**PROCEDURE 6-23. Checking and Changing BNS-2000 Series M1 Shelf Fuses** (continued)

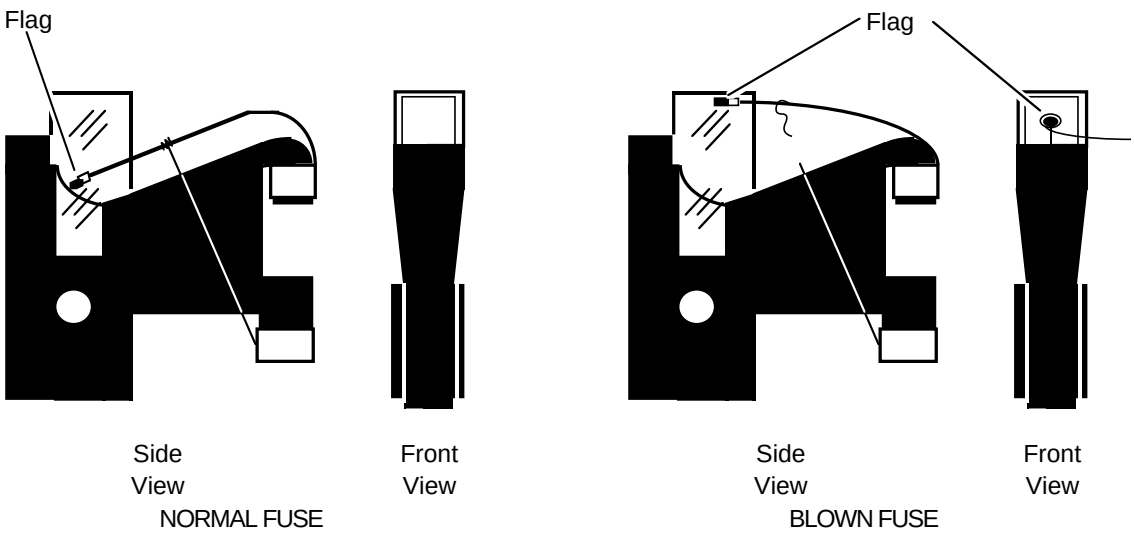


**FIGURE 6-6. Series M1 Shelf Fuses: Normal and Blown**

2. To change a fuse:
   a. Use pliers to grasp and remove the fuse.
   b. Discard the blown fuse and insert a new one.
3. Isolate and correct the condition causing the fuse failure:
   a. Remove the module, insert a new fuse, and then re-insert the modules.
   b. If the fuse blows again, replace the module.
   c. If the fuse blows after module replacement, replace the I/O board.

## Control Computer Problems

This section gives checklists and procedures for handling general Control Computer problems, disk and tape problems, MRC and dual Control Computer problems.

### TABLE 6-31. Control Computer: General Problems Checklist

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____ | System locked up (system *hung*) | Power problem | Check power; see Tables 6-20, 6-29. |
| ____ | System not functioning | Control Computer malfunction | Reboot the system; see the **Node Operations** chapter. |
| ____ | All calls on node disconnected | Switch, CIM, CTRM, or Control Computer module failure | Check for babbling ports. |
| ____ | All calls on node stay up | Loose cable | Restrict access to node. |
| ____ | Cannot originate new calls | System overloaded | Remove trunk from service. |
| ____ | No response from Control Computer | | |
| ____ | Cannot run commands at **`CC0>`** prompt | | |
| ____ | Control Computer constantly reboots | Corrupted disk file | See the Procedure for Checking a Disk File System. |
| ____ | Node cannot be booted | Switch module, CTRM, CIM, I/O board, or cable faulty | See the Procedure for Handling Control Computer Booting Problems. |
| | | ECPU or SCSI/DKI module, I/O board, or cable faulty | See the Procedure for Relacing a CTS1 I/O Board. |
| | | CCM module, I/O board, or cable faulty | See the Procedure for Handling CIM and CTRM Failure. |
| | | MRC resetting Control Computer | See the Procedure for Solving MRC Access Problems. |
| ____ | CCM failure | Power problem | See the Procedure for Performing Voltage Checks for Series M2 and M1 Shelves. |
| ____ | Red LED lit on CCM | | See the Procedure for Handling Control Computer Booting Problems. |
| ____ | Tape Drives<br>Unable to read/write tape | SCSI id on external tape drive is incorrect. | Check SCSI address on back of external tape drive; it must be 3. |

**TABLE 6-31. Control Computer: General Problems Checklist** (continued)

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____<br>____ | Control Computer green LED not lit<br>Control Computer not recognizing modules or restoring them to service | Modules unable to communicate with the Control Computer<br>Insufficient shared memory | See the Procedure for Handling Module Recognition and Restoration. |
| ____<br>____ | Yellow LED lit on SCSI/DKI module<br>Red LED lit on SCSI/DKI or ECPU module | ECPU module failure<br>SCSI/DKI failure | See the Procedure for Handling Control Computer Booting Problems. |
| ____<br>____<br>____ | SCSI/DKI not passing self diagnostics<br>Boot diagnostic failure<br>Green and yellow LEDs lit | Cabling problems<br>Incorrect switch settings on ASP4B I/O board<br>ASP4B I/O board incorrectly inserted | Check cabling to ASP4B I/O boards.<br>Check switch settings on ASP4B I/O board.<br>Verify that ASP4B I/O board makes proper contact on backplane. |

### PROCEDURE 6-24. Handling System Lockup

**Application:** All configurations.

**Status:** The **`CC0>`** prompt appears on the console.

1. Check for symptoms of node overload (babbling ports, etc.) as shown in the general power problems checklist table.
2. See the procedure for Solving Console Problems if the console cannot access the Control Computer (no response to input).
3. Go to monitor mode; see the *Commands Reference.*
4. Run the **di** monitor mode command to test the Control Computer.
5. Depending on the results of the diagnostic tests, replace any faulty modules or I/O boards associated with the faulty modules.
6. Check the file system using the **fsck** command; see the procedure for checking a disk file system.
7. Reboot the Control Computer. During the reboot, verify that the Control Computer is accessing the drive; see the procedure for accessing the disk and tape drives.
8. Check the cabling and reseat the Control Computer modules and I/O boards.
9. See the following procedure on booting problems.

### PROCEDURE 6-25. Handling Control Computer Booting Problems

**Application:** All configurations.

1. *For the CCM system,* check the SCSI bus cables.

   *For the ECPU system,* check the switches on the ASP4B I/O board, the M-bus, and SCSI/DKI bus cables.

2. Move the controller mode switch on the CCM or the mode switch on the ECPU module to the DIAG position to boot the node.

   The boot process takes place in interactive steps. When an error message appears, perform the action described in the *Messages Reference.*

3. Run diagnostics on the Switch and Control Computer modules. For BNS-2000 nodes, run diagnostics for the CIM and CTRM; for BNS-2000 VCS nodes, run diagnostics on the Clock.

4. Replace modules, I/O boards, or cabling as necessary.

5. Check the backplane voltages and look for bent pins; see the appropriate procedures provided in this chapter.

6. Power the system down, then power it up; see the **Node Operations** chapter.

7. If the MRC is resetting the Control Computer, see Table 6-33.

---

### PROCEDURE 6-26. Handling Module Recognition and Restoration

**Application:** All configurations.

**Status:** The port A console displays the **`CC0>`** or **`CC1>`** prompt.

1. Use the **dstat module** command to see the expected and actual module types for the slot.

2. Verify that the module is seated correctly in its slot, the mode switch is in the ENABL position, and a green LED is lit.

3. If the slot is occupied, the module is seated correctly, and the **dstat module** command reports an empty slot, physically remove the module, place it in another slot, and re-run the **dstat** command.

4. Use the **restore** command at the **`CC0>`** or **`CC1>`** prompt to bring the module into service.

5. If the module cannot be restored, check the voltage and the fuse for that slot; see the appropriate procedures provided in this chapter.

6. Run module diagnostics described in the appropriate module reference.

7. Reseat or replace the module or I/O board, as necessary.

8. If diagnostics pass, or if they fail on a replacement module, try to restore the module in

**PROCEDURE 6-26. Handling Module Recognition and Restoration** (continued)

another slot.

9. Use the **initialize controller** command.
10. Check shared memory constraints as described in the *Planning Guide.*
11. If one or more cabinets are affected, run Switch module, Clock, and Control Computer diagnostics. For BNS-2000 nodes run CIM and CTRM diagnostics; for BNS-2000 VCS nodes, run Clock diagnostics.

**TABLE 6-32. Control Computer: Disk and Tape Problems Checklist**

| √ | Problem Area | Possible Causes | Information Source |
|---|---|---|---|
| ____ | Difficulty accessing drives | Improper SCSI cabling | See **Node Installation** chapter. |
| ____ | Green LED off | Faulty disk or tape drive | See the procedure for Solving Disk and Tape Drive Access Problems. |
| ____ | Green LED on; yellow LED (CCM system) or red LED (ECPU system) not flashing | Disk or tape read/write errors | See the procedure for Checking a Disk File System |
| ____ | System fails to boot | No power to the disk or tape | See the procedure for Checking and Changing Shelf Fuses. |
| ____ | Disk cannot be read | Corrupted disk file | See the procedure for Checking a Disk File System. |
| ____ | No commands can be executed | Stackable connectors improperly seated | See the procedure for Solving Disk and Tape Access Problems. |
| ____ | Files cannot be backed up or retrieved from tape | | |
| ____ | Red SCSI LED lit (CCM system) | Faulty disk or tape drive<br>SCSI id incorrect on external tape drive | |

The file system check (**fsck**) command can be used to check the integrity of disk contents. The **fsck** command finds problems with the file system, reports and corrects them, and then automatically reboots the Control Computer (warm reboot). Existing connections stay up during this reboot process, but new calls cannot be set up until the reboot has completed. See the table provided for information on troubleshooting disk and tape drive problems.

### PROCEDURE 6-27. Checking a Disk File System

**Application:** All configurations.

**NOTE:** In operations mode, do not run the **fsck** command on the active root file system. Concurrent changes to the file system by **fsck** and a process running in operations mode may produce inconsistencies. Instead, reboot, bring the system to the standalone utility shell, and then run the **fsck** command on the active root file system. The system will be down while the **fsck** command is running, but existing calls will stay up.

To run the **fsck** command on any other unmounted file system, enter the **utilsh** command at the **CC0>** or **CC1>** prompt, then enter the **fsck** command with appropriate options as described in steps 1 and 2.

1. To check the currently active root file system, either
   a. Reboot the Control Computer to standalone utility mode:

```
CC0> init standalone
. . .
UTILITY> fsck -y
```

   The **-y** option means questions appearing during the check will be answered *yes*; **fsck** defaults to checking the active root file system

   b. Reboot to operations mode from a second disk and enter utility mode from operations mode. Use the **dstat cc** command, in operations mode, to identify the active root file system (for example, */dev/dskp0*) or use the **mount** command, in utility mode, with no arguments. Run the **fsck** command as described above on any file system other than the ones reported by the **mount** command

2. To check a *specific* file system, enter **fsck -y** <*file system*> at the **UTILITY>** prompt.
   - **fsck -y /dev/dskp0** checks the active file system (partition 0) on the primary SCSI bus (for example, disk 0 of Control Computer 0; disk 1 of Control Computer 1)
   - **fsck -y /dev/dsks0** checks the active file system (partition 0) on the secondary SCSI bus (for example, disk 1 of Control Computer 0; disk 0 of Control Computer 1)
   - **fsck -y /dev/dskp1** checks the staging partition (1) on the primary SCSI bus (for example, disk 0 of Control Computer 0; disk 1 of Control Computer 1)
   - **fsck -y /dev/dskp3** checks the standby file system (partition 3) on the primary SCSI bus (for example, disk 0 of Control Computer 0; disk 1 of Control Computer 1)
   - **fsck -y /dev/dsks1** checks the staging partition (1) on the secondary SCSI bus (for example, disk 1 of Control Computer 0; disk 0 of Control Computer 1)

**PROCEDURE 6-27. Checking a Disk File System** (continued)

- **fsck -y /dev/dsks3** checks the standby file system (partition 3) on the secondary SCSI bus (for example, disk 1 of Control Computer 0; disk 0 of Control Computer 1)
- **fsck -y /dev/dskp2** checks the auxiliary file system (partition 2) on the primary SCSI bus (for example, disk 0 of Control Computer 0; disk 1 of Control Computer 1)
- **fsck -y /dev/dsks2** checks the auxiliary file system (partition 2) on the secondary SCSI bus (for example, disk 1 of Control Computer 0; disk 0 of Control Computer 1)

When the file system check is finished, the **`UTILITY>`** prompt reappears, unless the active root file system was checked and some changes were made causing the system to reboot.

3. Using the **fsck** command, attempt to restore the file systems on the active and standby Control Computers. Repeat until the command executes without any errors.
4. If the command cannot execute without errors, reformat and reload the affected disk partitions, replace the disk (ECPU system) or replace the CCM (CCM system).
5. If the **fsck** command cannot execute at all, use the procedure provided in this chapter to check disk drives.
6. Repeat the **fsck** command if corruption was found the first time. The second **fsck** should be error free.

---

**PROCEDURE 6-28. Solving Disk and Tape Drive Access Problems**

**Application:** All configurations.

**NOTE:** Always pull modules before reseating I/O boards.

1. If the green LED is off, there may be a lack of power.
   a. Check for improperly installed boards and reseat them, if necessary.
   b. If the console is not working and the shelf has +12 V power, replace the power supply.
   c. Check for a blown slot fuse.
   d. Check for a blown fuse on the drive module, and replace the drive module, if necessary.
2. If the green LED is on, but the red LED (ECPU system) or the amber disk access light or the amber tape access light (CCM system) does not blink, do the following:
   a. Verify that the board is in the correct slot and there is a tape in the tape drive.
   b. Verify that the disk is spinning; if not, the drive is bad. Replace the disk drive (ECPU system) or replace the CCM (CCM system).
   c. Verify that the module is properly inserted and the latch fully closed.

**PROCEDURE 6-28. Solving Disk and Tape Drive Access Problems** (continued)

d. Verify that the cable to the I/O board is properly connected.

3. If the green LED is lit while the red LED (ECPU system) or the amber disk access LED (CCM system) is blinking, the drive is being accessed. If *either* the tape or disk drive cannot be accessed, the problem may be improper SCSI or other cabling, or an I/O board or drive problem.

   a. Verify that the CTS1/CTS2 is seated and cabled properly (CCM system); or verify that the ASP4B I/O board switch settings are correct, and that the board is seated and cabled properly (ECPU system).

   b. *For the ECPU system only,* check the bus terminating resistors.

      For a single disk system, bus terminating resistors should be present on the tape drive and absent from the disk drive. (All drives are shipped with bus terminating resistors.)

      For dual Control Computers, the bus terminating resistors should be removed..

   c. Check cabling connectors and fix any faulty connection.

   d. *For the ECPU system only,* pull out the tape or disk drive (one at a time) to see if the problem clears up.

4. *For the CCM system only,* if the red LED by the SCSI connectors on CTS1 or CTS2 or the SCSI fault LED on CSD9 is lit, there is a SCSI bus problem.

   Check for bent pins on the SCSI connectors or for bad cables.

5. If a dual Control Computer configuration is being used and there is a primary bus problem, go to monitor mode and use the **boot s/0** command to attempt to boot from the secondary disk; see the **Node Operations** chapter.

   The disk subsystem has two semi-independent buses. Any failed component on a bus can disable the entire bus. The CTS1/CTS2 or ASP4B I/O boards have independent circuitry for both buses. A bad I/O board can work on one bus, but not the other. If disks can be accessed, then the problem is probably the I/O board or the primary Control Computer.

6. Run DKI and disk/tape subsystem diagnostics for the active (and standby) Control Computer. Reseat or replace faulty modules and I/O boards as necessary; see **di** monitor mode and **run /diag** loader mode commands in the *Commands Reference*.

. For the *disk drive* only:

   a. If the drive is spinning and the red or yellow LED blinks but the access fails, the drive may be faulty, corrupt, or unformatted. Error messages provide an indication of the problem; see the *Commands Reference* to check for a corrupt disk file system (the **fsck** command), and to format or reformat a disk (the **run /diag/cert** command). If the drive is faulty, replace the CCM (CCM system) or replace the disk drive (ECPU system).

   b. If the drive is spinning and the red or yellow LED is blinking a repeated code of long and short flashes, the drive has failed its internal diagnostics. Check power to the drive.

**PROCEDURE 6-28. Solving Disk and Tape Drive Access Problems** (continued)

If the drive is faulty:

*For the CCM system,* replace the CCM.

*For the ECPU system,* replace the drive.

**CAUTION:** After replacing a CCM or ECPU disk drive, you must reload the software and the database.

8. For the *tape drive* only:

   a. If the red or yellow LED is lit and the tape is moving, the drive may be retensioning or resetting, which can take about two minutes. Attempts to access the drive during this period will fail. Wait a few minutes and try again.

      **CAUTION:** Ejecting a tape during the tape initialization sequence may damage the tape or drive.

   b. If the red LED on the 40MB tape drive (ECPU system) or the green tape LED of the DDS tape drive (CCM system) is blinking a repeated code of long and short flashes, the drive failed internal diagnostics or the tape is bad. Try re-inserting the tape or using a different tape or tape drive.

   c. If re-inserting the tape or using a different tape drive fails, the tape cartridge may be bad. Try a different tape. If an archive tape (used for backups) is used, reformat the tape using the **run /diag/cert** command.

      **CAUTION:** *For ECPU system only,* reformatting erases the tape; use only a tape containing information that is no longer needed. (CCM tapes do not require reformatting.)

   d. If an attempt was made to write to a write-protected tape, accessing the tape will fail. Check the position of the write-protect slide on the tape; see the figures provided in the **Maintenance** chapter.

   e. Check the labeling of the tape to ensure that appropriate tape (release tape or backup tape) is being used.

      *For the ECPU system,* if the tape is unformatted, enter **run /diag/cert** at the **LOADER>** prompt; see the *Commands Reference*.

   f. *For the ECPU system,* attempt to back up the database to the secondary tape for the active Control Computer.

   g. Check the SCSI bus cabling between the Control Computers by switching to the standby Control Computer and backing up the database to the faulty tape drive.

### TABLE 6-33. Dual Control Computer and MRC Problems Checklist

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____ | Control Computer switchover | Control Computer failure detected by MRC | See the procedure for Solving Standby Control Computer Problems. |
| ____ | Standby Control Computer failed | Faulty Control Computer module | Use the **restore standby** command at the **MRC>** prompt to verify that the standby Control Computer is restored. |
| ____ | A switchover fails | MRC improperly configured | |
| | | Faulty CTRM/CIM connection | Check CTRM/CIM cabling. |
| | | | Run CTRM/CIM diagnostics. |
| | | Corrupted disk file | See the **Node Operations** chapter. |
| | | MRC cabling | See the **Node Installation** chapter. |
| | | Improper backplane or power connections | See the procedure for Responding to MRC Alarms. |
| ____ | Booting process stopped prematurely | Cabling problem | Check cabling and console terminal settings. |
| ____ | Data Loss | Incorrect console terminal settings | See the procedure for Solving Console Problems. |
| ____ | Garbage displayed on console | Port B sent distracting signals to the Control Computer | Restore the MSM, SAM, or TY port using the **restore** command. |
| ____ | Console on port A or B cannot communicate with Control Computer | Defective console terminal | |
| | | Defective Control Computer or MRC module | |
| | | Console connected to out-of-service MSM or TY port | |
| ____ | **dstat cc** operations command reports standby Control Computer as **Failed**, but MRC reports Control Computer as **Booting** or **In-service** | Faulty cabling | See the procedure for Obtaining Standby Control Computer Status. |

**TABLE 6-33. Dual Control Computer and MRC Problems Checklist** (continued)

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____ | Both Control Computers display a **CC>** prompt or neither display a **SC>** prompt | Incorrect MRC option or connection<br>MRC failure | See the procedure for Recovering from Multiple Active Control Computers for a CCM System and the procedure for Recovering from Multiple Active Control Computers for an ECPU System. |
| ____ | Yellow LED lit; red occasionally blinks (ECPU only) | MRC waiting for a download after MRC **load** command | See the procedure for Correcting MRC Looping or Expected Download. |
| ____ | Cannot access **MRC>** prompt | MRC failure | See the procedure for Solving MRC Access Problems. |
| ____ | Cannot access MRC commands | MRC requires a download | |
| ____ | Cannot get MRC status reports | | See the procedure for Solving MRC Access Problems. |
| ____ | Red LED lit | MRC port problem | |
| ____ | Yellow LED lit; red not blinking | | See the procedure for Correcting MRC Diagnostic Failure. |
| ____ | Green LED lit and MRC passes internal diagnostics and boots, but still cannot communicate with MRC ports | Bypass enabled (CCM only) | See the procedure for Using Bypass with an MRCIO. See the procedure for Correcting MRC Diagnostic Failure. |
| | | | See the procedure for Using Bypass with an MRCIO. |

### PROCEDURE 6-29. Obtaining Standby Control Computer Status

**Application:** All configurations.

**Status:** The **CC0>** or **MRC>** prompt appears on the console.

1. At the **CC0>** prompt, enter the **dstat cc** command.

   At the **MRC>** prompt, enter the **display status** command.

2. If the standby status reported by the MRC is *failed* or *out of service* (the **dstat cc** command reports the standby Control Computer as **Failed** ) and the MRC **display status** command output shows **Booting** or **In-service**, the problem may be as follows:

   *in a CCM system,* a faulty A1B1C1 cable;

   *in an ECPU system,* a faulty S cable connection.

   Check the connections and reseat or replace the cable.

---

### PROCEDURE 6-30. Solving Standby Control Computer Problems

**Application:** Configurations with an MRC.

**Switches:** CC0: DIAG; CC1: DISAB.

1. At the **CC0>** prompt, enter Escape Escape to go to the **MRC>** prompt.
2. At the **MRC>** prompt, run the **display status** command. If the status report shows **Recovery=Off** , use the **set recovery on** command to turn on automatic recovery.
3. If the problem persists, turn off automatic recovery and disable the MRC monitoring of the standby Control Computer by entering

```
MRC> set recovery off
MRC> remove standby
```

4. Connect a console to the standby Control Computer.

```
MRC> connect standby
```

5. Move the standby Control Computer into monitor mode, then use the **di** command to test the standby Control Computer; see Procedure 6-2. For extensive testing, use the loader mode diagnostics from the active Control Computer.

**PROCEDURE 6-30. Solving Standby Control Computer Problems** (continued)

6. Replace the faulty module or associated I/O board and reboot the standby Control Computer to get to the **SC1>** prompt.
7. Verify that the Control Computer can access the disk drives using **dstat cc**; for any access problems, see the disk access procedure provided in this chapter.

   *For the CCM system*, if the standby is CC0 and the CTS1 I/O board needs to be replaced, see the following procedure.
8. When the standby Control Computer is operational:

```
SC1>  Escape  Escape
MRC>  restore standby
.  .  .
MRC>  set recovery on
```

9. Check the standby Control Computer status by entering **display status** at the **MRC>** prompt.

### PROCEDURE 6-31. Replacing the CTS1 I/O Board

**Application:** Dual CCM configurations when a CTS1 needs replacing.

**Requirements:** Make sure automatic recovery is set to *off* and that auto backup of the database is *off*.

**Switches:** CC0: DIAG; CC1: DIAG.

A CTS1 I/O board maintains a "memory" of which controller was last active, even when it has been removed from a node. The following is the safest procedure to use, so that CTS1 I/O boards consistently "remember" that CC1 was last active. If this has not been followed, there is a possibility that installation of the CTS1 into a different node could result in two active controllers. See the next procedure to clear that situation.

1. First, to remove the CTS1 I/O board, attempt to do the following. (If the MRC is not responding, go to step 2.)
   a. If CC0 is active, make CC1 active by entering the following commands:

```
MRC> set recovery off
MRC> connect 0
CC0> stop
LOADER> Escape Escape
MRC> switchover
MRC> connect 0
SC0> stop
LOADER> monitor
```

   b. Remove the CCM for Control Computer 0.
   c. Remove cables from the CTS1 I/O board and then remove the CTS1 from the node.
2. If there is no response from the MRC, it will not be possible to bring the node down gracefully. The LEDs should indicate which Control Computer is active.

   *If CC0 is active:*

   a. Put the mode switch on CC0 in the DISAB position, then do the same with CC1.
   b. Unlatch the CCM boards, first CC1 and then CC0, and pull them out.
   c. Remove the CTS1 and its cables.

**PROCEDURE 6-31. Replacing the CTS1 I/O Board** (continued)

*If CC1 is active:*

a. Put the mode switch on CC0 in DISAB.

b. Unlatch CC0 and pull it out.

c. Remove the CTS1 and its cables.

3. When installing the CTS1 I/O board:

   a. Make sure CCM for CC0 is not plugged into its slot.

   b. Insert CTS1 and cable it; see the appropriate procedure in the **Node Hardware and Software Upgrades** chapter.

   c. Connect to the port M.

   d. Insert CCM for CC0, move switch on board from DISAB to DIAG.

   e. At the **MRC>** prompt, enter the **dstat** command.

   f. If the **dstat** command does not display CC1 as the active controller, put the mode switch on both CCMs in ENABL and at the **MRC>** prompt, enter the **switchover** command to synchronize the MRCIO and controllers.

      If removal procedure was followed when this new CTS1 was last removed from a node, this step should not be necessary.

   g. Connect to each controller to ensure that the state of each is as expected.

### PROCEDURE 6-32. Recovering from Multiple Active Control Computers for a CCM System

**Application:** Dual CCM configurations.

1. Enter the **display status** command at the **MRC>** prompt to detect which CCM should be active. The active LED for that CCM should be lit, and the active LED for the standby CCM should be *off*.
2. Connect to each Control Computer and make sure that the prompt from one is active and the prompt from the other is standby, for example: **CC0>** and **SC1>.**
3. If both are active or both are standby; for example **CC0>** and **CC1>** or **SC0>** and **SC1>,** do a switchover.

   At the Control Computer prompt, enter Escape Escape and then at the **MRC>** prompt, enter the **switchover** command.
4. If you cannot connect to both the Control Computers, check the A1B1C1 cable, and replace it.
5. If both Control Computers are still active, after both have been reset then either the A1B1C1 cable is bad or the CTS1 I/O board is bad; replace the faulty component.

   If replacement parts are not available, pull one CCM and run the node as a single Control Computer configuration. Never leave two controllers in an active state or the database may be corrupted.
6. After the problem is resolved, reboot any Control Computers still in the node to make sure that the switch memory is correct.

### PROCEDURE 6-33. Recovering from Multiple Active Control Computers for an ECPU System

**Application:** ECPU system nodes using an MRCM.

**Switches:** CC0: DIAG; CC1: DISAB.

1. Check the R0 and R1 cables from the active and standby Control Computers to the MRCM.
2. Verify that the S cable is properly connected; refer to the **Installation** chapter.
3. While directly connected to port M, run MRCM diagnostics.
4. Bring the node down. First, take down the standby Control Computer as follows:

```
CC0> Escape Escape
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

   Now bring down the active Control Computer, as follows:

```
CC0> stop
. . .
LOADER> monitor
. . .
```

5. If necessary, reseat or replace the MRCM module and/or the AWJ16B I/O board.

   **CAUTION:** Remove the module before removing and replacing the I/O board.

6. Check the switch settings on the AWJ15 and the ASP4B I/O boards.
7. Reboot the node.

### PROCEDURE 6-34. Using Bypass with an MRCIO

**Application:** Single or dual CCM configurations with a MRCIO; use this procedure to troubleshoot problems in accessing either the console or MRC.

**Requirements:** Make sure automatic recovery is set to *off* and auto backup of the database is *off*.

A toggle switch on the back of the CTS1 I/O board resets the CTS1 if toggled in one direction, or puts it into the bypass mode when toggled in the other direction.

1. To reset the CTS1 board, push the toggle switch to the left into the RESET position until a click is heard and then allow it to spring back to the center.
2. To enable bypass mode, push the toggle switch on the CTS1 board to the right into the BYPASS position and leave it there; a yellow LED will light up.
3. To disable bypass mode, push the toggle switch back to the center; the yellow LED should be *off*.

   In bypass mode, port A and port B of the cable to the CTS1 are connected directly to the active Control Computer. Do not use the **connect** command from the M port to attempt to connect to either CCM while in bypass mode.

   **NOTE:** You may be in bypass mode if you can communicate with the A or B ports normally, but attempts to reach the MRC through the attention sequence yield the system response, **`INPUT ERROR: Unknown command.`** If in bypass mode, the **dstat cc** command shows the **`MRC STATUS`** field to be *failed* and attempts to **connect** to the active or standby Control Computers also fail.

### PROCEDURE 6-35. Solving MRC Access Problems

**Application:** Configurations with an MRC.

**Switches:** CC0: DIAG; CC1: DISAB.

**Status:** The port A console displays the **`CC0>`** prompt.

1. Check the cabling between the Control Computers and the MRC.
2. Check the Release Letter to verify that the MRC firmware is the correct version. If a different version is required, use the procedure provided in the **Operations** chapter to reload the firmware.
3. Verify that the port parameter is set to **`Command=On`** for ports A and B.
4. Verify that the correct attention sequence is entered for connecting to the MRC.
5. Verify the baud rates for ports A and B by using the **display status** command at the **`MRC>`** prompt. The baud rates set for the MRC must match the baud rates reported by the **verify node** command at the node console.
6. *For the ECPU system,* connect directly to the active Control Computer.

   *For the CCM system,* put the CTS1 I/O board into bypass mode by setting the switch on the back of the board to connect directly to the active Control Computer; see the procedure for using bypass with an MRCIO.
7. If consoles cannot communicate, check the cabling between the consoles and the MRC I/O board. The MRC ports B and M may require a null-modem adapter; the interfaces are: port A (DCE), port B (DTE), port M (DTE).
8. If communication can be established on at least one Control Computer port (A or B), enter the **verify node** operations command on the Control Computer to determine the baud rate of both ports. Enter the **display status** MRC command to verify that the baud rates match.
9. If communication can be established to the MRC, but incorrect characters are received when communication is established with the Control Computer, there is a baud rate mismatch. To communicate with the Control Computer, the baud rate of the terminal, the MRC port, and the Control Computer ports must match.

   **NOTE:** If the CTS1 is in bypass mode, an attempt to connect to a CCM from the M port may result in garbled characters being displayed. Take the CTS1 out of bypass.

**PROCEDURE 6-35. Solving MRC Access Problems** (continued)

10. If port A and port B appear to work properly, but port M does not, enter the **display status** command at the **MRC>** prompt on port A. Verify that the baud rate of the port M console terminal matches the baud rate of the MRC.

    a. If the baud rates match, press the reset button on the MRCM (ECPU system) or flip the toggle switch to the RESET position on the CTS1 (CCM system).

    b. If no output appears on port M, verify that the cabling is correct (a null-modem adapter may be required) between the MRC and port M.

    c. If the cabling is correct:

       *For the CCM system,* verify that the CTS1 I/O board is not in BYPASS mode; the yellow LED should be *off*. Verify that the red fault LED is *off* and the green LED is *on*.

       If the red fault LED is lit, replace the CTS1.

       *For the ECPU system,* replace the AWJ16B I/O board and/or the MRCM.

       **CAUTION:** Remove the module before removing and replacing the I/O board.

11. *For the ECPU system,* connect the console directly to the active Control Computer's port A or port B (not through the MRC). If this is successful, replace the faulty cable.

12. *For the ECPU system,* check the switch settings on the AWJ15 I/O board.

13. While directly connected to port M, run MRC diagnostics.

    a. Attach the MRC loopback connectors and run the **diagnose io** command on the console connected to port M; see the *Commands Reference*.

    b. If the test fails, examine the loopback connectors. Verify that they are the correct connectors, and that they are functioning properly.

    c. If the test still fails:

       *For the ECPU system,* reseat or replace the AWJ16B I/O board and rerun the test.

    d. If the test still fails, reseat or replace the MRCM, or the CTS1 (CCM system) and rerun the test.

14. Verify that the fuses are intact; see the related procedures in this chapter.

### PROCEDURE 6-36. Responding to MRC Alarms

**Application:** Configurations with an MRC.

**Switches:** CC0: DIAG; CC1: DIAG.

**NOTE:** Always use the **set recovery off** command at the **`MRC>`** prompt, before entering **switchover** (MRC command), **initialize active** (MRC command) or **initialize controller** (operations command).

1. Verify that the active Control Computer displays the **`CC0>`** or **`CC1>`** prompt.
2. For a BNS-2000 nodes, verify that the green LEDs on the Switch module, CIM, and CTRM and active Control Computer modules are lit.

   For a BNS-2000 VCS node, verify that the green LEDs on the Switch and active Control Computer modules are lit.
3. If no LEDs are lit, the boards are not receiving proper power, or are not plugged into the backplane. Check power connections.
4. Check the activity prior to a switchover or Control Computer failure using the MRC **display status** command.
5. See if the alarms and status reports from the MRC show the original active Control Computer in a **`Failed`** state.

   If the **initialize controller** command was run at the **`CC0>`** or **`CC1>`** prompt, the node will attempt to reboot the active Control Computer.

   When the MRC senses that the active Control Computer is not in the **`In-service`** state, it attempts to switch to the standby Control Computer if **`Recovery=On`** .
6. *For the CCM system*, check the A1B1C1 cable from the active Control Computer to the standby Control Computer. Swap the A1B1C1 cable to check for a faulty cable.

   *For the ECPU system*, check the R0/R1 cable from the active Control Computer to the MRCM. Swap the R0/R1 cable to check for a faulty cable.
7. Use the **display status** command at the **`MRC>`** prompt to check the status of the standby Control Computer.

   If it is **`Out-of-service`** or **`Out-of-service, Failed`** , use the **restore standby** command at the **`MRC>`** prompt.

**PROCEDURE 6-36. Responding to MRC Alarms** (continued)

8. Connect to the standby Control Computer at the **`MRC>`** prompt.
   a. If the **`MONITOR>`** or **`LOADER>`** prompt appears, boot the standby Control Computer to operations mode.
   b. If the **`SC0>`** or **`SC1>`** prompt appears, the standby Control Computer is properly booted. Use the MRC **display status** command to see if **`Recovery=On`** .
9. Use the **verify node** command from the active Control Computer to verify that the Control Computer is in the correct slot.
10. *For a BNS-2000 ECPU system,* check the cabling from the MRC to the ASP7B I/O board. *For a BNS-2000 VCS ECPU system,* check the cabling from the MRCM to the ASP1 I/O board.
11. Use the monitor mode **di** command and then loader mode **run /diag** command to detect failed circuit boards or faulty cabling.

### PROCEDURE 6-37. Correcting MRC Diagnostic Failure

**Application:** Nodes using MRC.

**Switches:** CC0: DIAG; CC1: DISAB.

1. *For the CCM system,* toggle the switch on the back of the CTS1 I/O board into the RESET position. The green LED blinks momentarily during the reset, then the red and yellow LEDs stay lit while firmware diagnostics are running.

   *For the ECPU system,* press the reset button on the faceplate of the MRCM. The red LED blinks momentarily during the reset.

2. If the red LED lights and continues to stay lit, replace the MRCM (ECPU system) or the CTS1 I/O board (CCM system).

3. *For the ECPU system,* if this does not correct the problem, replace the AWJ16B I/O board.

4. Check the slot voltage and fuses; see the related procedures provided in this chapter.

---

### PROCEDURE 6-38. Correcting MRC Looping or Expected Download

**Application:** Nodes using MRC.

**Switches:** CC0: DIAG; CC1: DISAB.

1. If the *loop continuous* option is chosen for the **diagnose internal** command, the following messages appear on the port M console after the **`WATCHDOG TEST`** (ECPU system) or **`BAD ADDR TEST`** (CCM system) message:

   ```
   Waiting for reset
   Hit any key to stop loop continuous.
   ```

   To end the continuous looping, press any key within 3.5 seconds after the message above.

2. If the yellow LED (ECPU system) or red LED (CCM system) stays lit, look at the output on the port M console. If the **load** command was previously executed at the **`MRC>`** prompt, the MRC is waiting for a download from either the active or standby Control Computer. Refer to the **load** command in the *Commands Reference* for instructions.

### PROCEDURE 6-39. Solving Console Problems

**Application:** Nodes using MRC.

**Switches:** CC0: DIAG; CC1: DISAB.

1. Check the cabling to ports A and B on the Control Computer.

   *For the CCM system,* check the cabling to the port A, B, and M connections and the cabling between the CTS1 and CTS2 I/O boards.

   *For the ECPU system,* check the cabling between the MRCM and the console.

   Refer to the **Node Installation** chapter.

2. Verify that the baud rate and parity of the console terminal match the baud rate and parity specified for the Control Computer and MRC.

   a. Use the **verify node** command to check the Control Computer.

   b. Use the **display status** command to check the MRC.

3. If the console is operating properly and an MRC is present, verify that the active Control Computer is in service by using the **display status** command at the **MRC>** prompt.

4. *For the CCM system,* put the CTS1 I/O board into BYPASS mode so that port A is connected directly to port A of the active Control Computer.

   a. If garbled characters are displayed on the console, verify that the console terminal baud rate is configured according to the database, or according to the default settings in the **Node Installation** chapter.

   b. If some or all characters typed at the keyboard are not displayed on the console, verify that the console terminal's parity setting is properly configured and that the cabling to ports A, B, and M is correct.

   c. If none of the characters typed at the console are echoed, verify that the console terminal is cabled properly for its physical connection to either port A (DCE), port B (DTE) or port M (DTE).

   d. If all of the settings and cables are correct, replace the CCM.

**PROCEDURE 6-39. Solving Console Problems** (continued)

*For the ECPU system,* connect the console directly to Control Computer port A and see if it works.

a. If garbled characters are displayed on the console, verify that the console terminal baud rate is configured according to the database, or according to the default settings in the **Node Installation** chapter.

b. If some or all characters typed at the keyboard are not displayed on the console, verify that the console terminal's parity setting is properly configured and that the cabling to ports A, B, and M is correct.

c. If none of the characters typed at the console are echoed, verify that the console terminal is cabled properly for its physical connection to either port A (DCE), port B (DTE) or port M (DTE).

d. If all of the settings and cables are correct, replace the ECPU module.

5. If communication with the console is not re-established, reseat modules, I/O boards, or cabling as necessary.

6. If attached to the M port when in bypass mode, the MRC **connect** command does not work and may cause garbled characters to appear at the M port. Use the A and B ports to talk to the active controller directly, or take the CTS1 out of bypass mode.

## Switching, Clocking, CIM, and CTRM Problems on BNS-2000 Nodes

Problems related to the standard and extended switch complexes, along with CIM and CTRM problems are listed in the following table.

**TABLE 6-34. Switching, Clocking, CIM, and CTRM Problems Checklist**

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____<br>____ | AI-T1 diagnostic test failure<br>Alarms show **LOS** or **AIS** | SSM4 or STR4 not configured as reference for AI-T1 module<br>Loose connection to AI module configured as primary reference<br>Loose connection to CMC3 I/O board J5 or J6 connector<br>RIB is not seated properly or is missing | Check CMC3 jumper settings; see **Node Installation.**<br>Check and secure all cabling.<br>Verify that AI is in service.<br>Check module status with **dstat** commands.<br>Verify that the SSM4 or STR4 is properly configured.<br>See the *Messages Reference.* |
| ____ | Red LED lit on Switch | Faulty Switch or I/O board<br>Power failure<br>Configuration from Control Computer not loaded<br>Redundant Switch out of service or faulty | Restore the standby Switch.<br>Reboot Control Computer.<br>Run the **initialize hardware** command.<br>Reseat the Switch.<br>Reseat the Switch I/O boards.<br>Run the **run /diag/switch**; replace faulty modules. |
| ____ | Red LED lit (FAULT) on CTG13 Switch | Faulty CTG13 Switch or I/O board<br>Power failure<br>Configuration from Control Computer not loaded<br>Redundant CTG13 Switch out of service or faulty | Restore the standby CTG13 Switch.<br>Reboot Control Computer.<br>Run the **initialize hardware** command.<br>Reseat the CTG13 Switch.<br>Reseat the CTG13 Switch I/O boards.<br>Run the **run /diag/switch**; replace faulty modules. |

**TABLE 6-34. Switching, Clocking, CIM, and CTRM Problems Checklist** (continued)

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____ | Red LED lit (SuFAIL) on CTG13 Switch | Faulty SYNC unit | Remove and restore SYNC unit.<br>Reseat the CTG13.<br>Replace the CTG13.<br>Run the **run /diag/str4**; replace faulty modules. |
| ____ | Red LED lit on RIB | Failed RIB | See the RIB LED table in the beginning of this chapter. |
| ____ | Red LED lit on CIM or CTRM | Faulty Switch, CIM, or CTRM or I/O board. | See the Procedure for Handling CIM and CTRM Failure. |
| ____ | CTRM shelf number LED not lit | Faulty cabling. | Use the **initialize hardware** command. |
| ____ | **dstat** report shows empty slots | | Reseat modules.<br>Check cabling and fuses. |
| | | Extension Shelf not functioning properly | Run the **run /diag/ctrm_cim** commands; replace module if faulty. |
| | | Incorrect mode switch setting on CTRM | See the Procedure for Testing a Series M2 Extension Shelf. |
| | | Incorrect switch setting on ASP7B I/O board | Set mode switch on CTRM to ENABL.<br>See the **Node Installation** chapter. |

### PROCEDURE 6-40. Handling CIM and CTRM Failure

**Application:** All configurations.

**Switches:** CC0: DIAG; CC1: DISAB.

1. Use the **run /diag/ctrm_cim** loader mode diagnostics for the CTRM in each Control Shelf to isolate the trouble area.
2. Verify that the switches on the CTRM, CIM, and ASP7B I/O board are set correctly; see the **Node Installation** chapter.
3. Verify that the mode switches on the CTRM and CIM are set to ENABL.
4. Verify that the CTRM (slot 15) fuse is intact; see the procedure provided in this chapter for checking and changing Series M1 Shelf fuses.
5. Verify that the CIM fuse is intact; see the procedure in this chapter for checking and changing Series M2 Shelf fuses.
6. Check for bent pins on the backplane, modules, and I/O boards.
7. Replace the CTRM and rerun the diagnostics.
8. Replace the ASP7B I/O board and rerun the diagnostics.
9. If the external CTRM test fails, check the external loopback fiber cable connections.
10. Check the fiber connections between the ASP7B and CMC2 I/O boards.
    a. If the red LED on the CMC2 (CIM) I/O board is lit, swap the transmitter and receiver fiber ends, then repeat the diagnostics.
    b. If the connection appears secure, but the diagnostics still fail, replace the fiber cable.
    c. If the red LED is still lit, replace the CMC2 I/O board and repeat the diagnostics.
11. Replace the CIM and rerun the diagnostics.

### PROCEDURE 6-41. Testing a Series M2 Extension Shelf

**Application:** Nodes with Series M2 Extension Shelves.

Use this procedure when the **dstat shelf** command reports that a Series M2 Extension Shelf is out of service.

1. Use the **diagnose shelf** command to isolate the problem area.
2. If the diagnostics pass, use the **restore shelf** command to restore the shelf to service, and rerun the diagnostics.
3. If the diagnostics fail:
   a. For configurations with a standard switch complex, check the backplane and cabling connections for the CNA1 and CNA2 I/O boards.

      For configurations with an extended switch complex, check the backplane and cabling connections on the CNA8 I/O board and check the shelf number display.

   b. For configurations with a standard switch complex, check the switch settings on the CNA1 I/O board.

      For configurations with an extended switch complex, check the switch settings on the CNA8 I/O board.
4. Run a **dstat** <*module*> report for a known good module installed in the in-service Series M2 Shelf.
5. If the **dstat** command fails, replace the coaxial cable connection between the CNA1 and CNA2 I/O boards or the CNA8 I/O board. Rerun the command.
6. Run a **diagnose** <*module*> report for a known good module installed in the in-service Series M2 Shelf.
7. If the diagnostics still fail, replace the CNA1 I/O board (depending on the number of shelves configured) and rerun the diagnostics.
8. If the diagnostics still fail, replace the CNA2 or CNA8 I/O board (depending on the number of shelves configured) and rerun the diagnostics.

## GAR Problems on BNS-2000 nodes

GAR modules can only be installed in Series M2 Extension Shelves numbered 1, 2, or 3; they cannot be installed in shelves numbered 6 and 7.

GAR module problems are listed in the following table.

### TABLE 6-35. GAR: General Problems Checklist

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____ | Group address resolution is not taking place | | Check configuration and measurements from *StarKeeper* II NMS<br>Check data path using **verify trace** command and **display routes** command |
| ____ | Restore GAR process failed | Module is not installed<br>Mode switch on GAR is in DISAB position<br>Faulty module or I/O board | See the Procedure for Handling GAR Failure. |
| ____ | Output of **diag gar** indicates problems | | See **diag gar** command in *Commands Reference*. |
| ____ | Output of **dstat gar** indicates alarms or errors | | See **dstat gar** in *Commands Reference*. |

### PROCEDURE 6-42. Handling GAR Failure

**Application:** GAR module.

Follow steps 1 and 2, if:

- lost data is reported,
- a red LED on the GAR module is lit
- the green LED is not lit
- an error message appears on the console

1. Enter **verify gar** <*mod addr*> to determine if the GAR is entered in the database and is in service.
2. If the GAR is in service, run the **diag gar** command to further isolate the problem.
3. Check the **dstat gar** report.

## End User Problems

General problems that affect end users and those that affect end users connected via a modem or modem pool are listed in the following two tables.

**TABLE 6-36. End User: General Problems Checklist**

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____<br>____ | Difficulty connecting to node<br>Characters typed do not appear on screen or appear twice | Faulty terminal or data device, interface module malfunction, or blown fuse | See the procedure for Solving End User Inability to Connect. |
| ____<br>____ | Attention sequence gives no feedback<br>Missing prompt or broadcast message | Cables not connected<br>Control Computer down<br>Console port not administered or not restored<br>Device configured incorrectly<br>Terminal not controlling correct RS-232-C leads | Verify device connections.<br>See the procedure for Solving End User Inability to Connect.<br>If a is modem involved, see the Modem Pool Problems Checklist. |
| ____<br>____ | Difficulty completing a call<br>One of the following appears:<br>**`Busy Access denied`**<br>**`Busy Node not available`**<br>**`Busy trunk not available`**<br>**`Busy Host not available`**<br>**`Invalid route`** | Trunk busy or out of service,<br>Routing improperly administered<br>Address improperly administered<br>Ports, modules, or addresses out of service<br>Defective cabling/wiring or faulty equipment (network or attached)<br>Host not answering | Check for trunk outage, and security and trunk administration.<br>Check address administration.<br>Check for out of service ports, modules, and addresses.<br>Check cabling/wiring and for faulty equipment.<br>Check for improperly administered host. |

**TABLE 6-36. End User: General Problems Checklist** (continued)

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____<br>____ | Difficulty after connecting<br>Text appears garbled or is missing, or file transfers not working | Data device configured incorrectly<br><br>Problem with trunk | Verify data device configuration.<br>See the procedure for Resolving End User Problems after Connecting.<br><br>See *Trunk Module Reference* and *M2 Trunk Module Reference*. |
| ____<br>____<br>____ | End user cannot disconnect<br>File transfer fails or times out<br>End user disconnected, put on hold, or placed in command mode | End user's attention sequence performed incorrect function. | Verify that end user used appropriate attention sequence.<br>Verify that attention sequence characters are not in file being transferred. |

**PROCEDURE 6-43. Solving End User Inability to Connect**

**Application:** All configurations.

A. *At the end user site:*

1. Verify that the end user equipment is compatible with the parameters entered in the database.

   For example, check the settings for flow control, parity, and duplex. (Use the **verify** command, if operations mode is available.)

2. Check the cabling, RS-232-C leads, and fuses.
3. If the end user is a remote connection, check the modem.

B. *At the node:*

1. Verify that the database has the correct options.
2. Check the cabling, RS-232-C leads, and slot fuses.
3. Verify that the node is up and the module and port are in service.
4. Run the **diagnose** command on the module to which the user is connected; see the appropriate module reference.
5. If a modem pool is involved, see the following table and procedure.
6. If one or more trunks are involved, see the *Trunk Module Reference* or the *M2 Trunk Module Reference*.
7. If a CPM is involved, see the *Computer Port Module Reference*.

### PROCEDURE 6-44. Resolving End User Problems After Connecting

**Application:** All configurations.

A. *At the end user's site:*

1. Verify that the device is compatible with the parameters entered in the database and that it has the correct settings for flow control, parity, baud rate, local echo, and duplex. (Use the **verify** command if the operations mode is available.)
2. If using a host, check the host parameter settings.

B. *At the node:*

1. Verify that the database has the correct options.
2. Verify if the attention sequence that the user tried performed a function other than what the user intended.
3. Verify if the attention signal characters are in the file being transferred.
4. If one or more trunks are involved; see the *Trunk Module Reference* and the *M2 Trunk Module Reference*.
5. If a modem pool is involved, see the following table.

### TABLE 6-37. End User: Modem Pool Problems Checklist

| √ | Symptoms and Indicators | Possible Causes | Actions |
|---|---|---|---|
| ____ | Ports and modems are "busied out" | Incorrect modem options | See the procedure for Solving End User Modem Pool Problems. |
| ____ | Port removed from service | | |
| ____ | End user cannot connect to incoming modem pool | Incorrect endpoint options | |
| ____ | End user cannot connect to outgoing modem pool | Service address out of service | |
| ____ | `Too many invalid destinations` message received | Mismatched network/modem options | |

### PROCEDURE 6-45. Solving End User Modem Pool Problems

**Application:** Ports with modem pool connections.

A. *Common problems for both incoming and outgoing modem pools:*

1. Verify that ports are available; all ports or modems will be busy if not properly disconnected. If a port for a modem pool is removed for too many invalid destinations or for babbling, the modem and the network could be communicating as follows:
   a. The modem goes off hook.
   b. The network generates the **`DESTINATION:`** prompt.
   c. The modem generates the header **`DATAPHONE® II . . .`**
   d. The network responds **`INVALID DESTINATION`** and drops the call.
   e. The sequence above is repeated.
2. Mismatched network/modem options are at fault. Check the MSM-to-modem, SAM-to-modem, or TY-to-modem connections.

B. *End user cannot connect to an incoming modem pool:*

1. Verify that the end user has a correct in-service phone number.
2. Check all incoming modems for option settings that cause the modem to go off hook when ringing is received.
3. Call the modem to verify that it answers.
4. Verify that the answering modem can raise DTR or go off hook by some other means on the node side when it answers an incoming call.
5. Check MSM, SAM, or TY endpoint options. Incoming modem pool ports should be administered as *originate* ports.
6. Verify that the caller is using autobaud to get the network **`DESTINATION:`** prompt.

C. *End user cannot connect to an outgoing modem pool:*

1. Verify that the network destination is an in-service receiving port connected to a modem that receives dial tone from the switched network, or is connected to a private line.
2. Verify that the service address and all devices in the modem pool group are in service.
3. Verify that round robin service is configured for the modem pool group; if round robin service is not used, one nonfunctioning port can block access to the rest of the group.
4. Verify that the end user is aware of wake-up signals required by the modem, such as carriage returns.

# Node Hardware and Software Upgrades


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# Node Hardware and Software Upgrades

This chapter gives specific instructions on upgrading a node to BNS-2000 Release 5.0 functionality or upgrading a *Datakit* II VCS node to Release 6.0 functionality.

**NOTE:** Upgrade procedures are furnished for BNS-2000 nodes and for *Datakit* II VCS nodes only. Release 6.0 functionality is equivalent for both *Datakit* II VCS and BNS-2000 VCS.

Both product nodes require:

- a CCM with on-board hard disk as the central processor in the Control Computer, or
- an ECPU module (MC1D138A1) as the central processor in the Control Computer, plus a TN2175B disk and an Eswitch module (TN2099B).

Specifically, a BNS-2000 node requires new BNS-2000 software to run Release 5.0 and a *Datakit* II VCS node requires new *Datakit* II VCS software to run Release 6.0.

## Planning Notes

When planning an upgrade, refer to the *Ordering Guide*, which contains a list of upgrade kits with the parts required to upgrade from various configurations to BNS-2000 Release 5.0 or *Datakit* II VCS Release 6.0.

If using *StarKeeper* II NMS, be sure to perform the necessary operations for updating the node information on *StarKeeper*. See the *StarKeeper II NMS Core System Guide*.

To migrate a BNS-2000 network, Series M1 shelves may need to be upgraded. To migrate a *Datakit* II VCS network, individual nodes in the network may need to be upgraded from older to newer equipment. Either migration might involve replacing individual modules in the Control Computer complex, but leaving interface modules in place if they continue to be supported and are performing well.

When a node is to be upgraded to the new release, decisions must be made about the hardware. The following choices depend on plans for supporting existing services, as well as introducing new services:

- which Control Computer and Switch configuration to use
- whether to add new modules, replace outmoded modules (such as the TSM6 which is only supported in older versions of *Datakit* II VCS), or add new services.

Configurations involving *Datakit* II VCS nodes must also decide whether to keep existing *Datakit* VCS Model 2000 cabinets or install new modular cabinets

**NOTE:** Parts are no longer available for a Model 2000 node, which does not support the CCM system.

Note the following points when planning a BNS-2000 upgrade:

- A BNS-2000 node can function with a CCM or an ECPU system as its Control Computer. Either system can be equipped with a standard switch complex or an extended switch complex in its Series M2 Switch Shelf. Hardware upgrade procedures for the Control Computer system and the switch complex are provided in this chapter.
- A Series M1 shelf running the ECPU system can use the ASP8 or AWJ12 tape I/O boards.
- Series M1 shelves running the ECPU system must use the SCSI/DKI ASP4B I/O board with the ASP8 tape I/O board.

Note the following points when planning a *Datakit* II VCS upgrade:

- *Datakit* II VCS Release 2.1, 3.0, 3.1, and 4.0 CPU system hardware is the same.
- The TN1002B Switch module can still be used in the MPC.
- The TN2098 Disk module in a CPU/ECPU system must be replaced with the TN2175B (540MB) Disk module for Release 6.0.
- RAM is incorporated into the ECPU (MC1D138A1), therefore the RAM8 module does not have a replacement.
- Modular cabinets running the ECPU system can use the ASP8 or AWJ12 tape I/O boards.
- Model 2000 cabinets running the ECPU system must use the AWJ12 tape I/O board.
- Modular cabinets running the ECPU system must use the SCSI/DKI ASP4B I/O board with the ASP8 tape I/O board.
- Model 2000 cabinets running the ECPU system can use the SCSI/DKI ASP4 or ASP4B I/O board with the AWJ12 tape I/O board.
- Beginning with *Datakit* II VCS Release 4.0, mixed cabinet types are not supported in the same node; therefore, modular cabinets cannot be added to an existing Model 2000 node. To expand an older existing node, add the same type of cabinet, or convert to modular cabinets.

An MPC15 cabinet can be upgraded to a BNS-2000 or BNS-2000 VCS node for local switching by installing the Control Computer complex and Switch hardware. Consult with your account representative about the suitability of converting your particular hardware and software configuration.

## About the Upgrade Procedures

The procedures to upgrade the software depend upon the current hardware configuration and software release of a node being converted to run BNS-2000 Release 5.0 or *Datakit* II VCS Release 6.0. This chapter contains four major sections that explain four types of steps that you can use to upgrade hardware and/or software, and to backout of a software build upgrade. They are the following:

- *Upgrading to a New Software Build or to a Compatible Release*—use this set of instructions for nodes where hardware upgrades are not required. This is the simplest procedure and requires the minimum amount of downtime.
- *Backing Out of a Software Build Upgrade*—use this set of instructions for "undoing" an upgrade procedures that you might have started.
- *Upgrading the System to a New Release–General Method*—use this set of instructions to upgrade the current hardware and software release on the node to BNS-2000 Release 5.0 or to *Datakit* II VCS Release 6.0.
- *Upgrading the System to a New Release with Minimal Downtime*—use this set of instructions for BNS-2000 pre-Release 3.0 nodes containing dual ECPU processors or *Datakit* II VCS pre-Release 5.0 nodes containing dual ECPU processors and the MRCM to upgrade *only* the current software to the new release with minimal system downtime.

  The previous method must be used for other node configurations.

**NOTES:** Upgrades can also be done using the *StarKeeper* II NMS Software Download capability. Use Release 9.0 of *StarKeeper* II NMS. (See the *StarKeeper II NMS Core System Guide.*)

When upgrading release software from an earlier build or release, the boot of the new release software causes all downloadable modules (for example: FRM or TSM8) to be loaded with the new software. This results in the tear-down of any existing circuits on these types of module and a re-download of software.

For nodes running applications that require large numbers of call setups (such as PDDs) during system reboot, these applications should be removed from service prior to the upgrade and restored to service gradually after the node recovers from the system boot.

After completing the upgrade, for nodes running customized applications on the DKAP/HSDKAP module, the network administrator will need to install an updated version of the application software that is compatible with the new release.

For *Datakit* II VCS nodes, the ECPU system controller can handle about eight module downloads concurrently and the call setup rate of the system is about ten setups/tear-downs per second.

If *Datakit* II VCS node is equipped with more than 15 downloadable modules, these modules should be removed from service before the switchover to the new software to prevent overloading the Control Computer. After the node is booted to the operational mode at the **`CC0>`** or **`CC1>`** prompt, these modules can be restored manually about five at a time using the **restore** command.

# Upgrading to a New Software Build or to a Compatible Release

The following steps present the basic sequence of tasks for upgrading a BNS-2000 Release 4.0 system to a Release 5.0 system or to a later maintenance build of the release; or a *Datakit* II VCS Release 5.0 ECPU system to a Release 6.0 ECPU system, or to a later maintenance build of Release 6.0. This method does not include hardware upgrades.

**TABLE 7-1. New Software Build Upgrade Checklist**

| √ | Steps | Explanation |
|---|---|---|
| | 1. Planning the Upgrade | The equipment and software must be available, configuration decisions made, and a new software registration key obtained before upgrading can begin. |
| | 2. Preparing to Upgrade | The connection between the MRC and console must be checked, and the auto backup and recovery options must be disabled. |
| | 3. Preserving the Database | The configuration database must be stored where it can be retrieved operationally, for normal operations or in case of difficulties. A report copy of the database should be generated. |
| | 4A/4B. Upgrading the Software to a New Build or a Compatible Release | The application software is installed as required; see procedures in this chapter. |
| | Loading the Software<br>Retrieving the Database | The database is retrieved from disk, tape, or *StarKeeper* II NMS host storage, depending on your original software and hardware configuration. If using this technique for an upgrade from BNS-2000 Release 3.0 or 4.0 to Release 5.0 (Step 4A) or from *Datakit* II VCS Release 5.0 to Release 6.0 (Step 4B), a database upgrade (**dbupgrd**) is performed. |
| | Rebooting the Node | When the node reboots, the hardware and software will provide service on the new build. |
| | 5. Verifying the Database Against the Original | In this optional step, the report copy of the database is compared to the results of new reports to ensure that all of the installed trunks and modules are equivalent to the original capability.<br>This step completes the upgrade process. |

## Step 1. Planning the Upgrade

The upgrade must be planned to insure that all the equipment is available to complete the upgrade. The software and tapes must be available, as well as sufficient staff and node outage time to perform the upgrade.

The following table gives an approximate time for each step and an indication of node outage, if applicable. Use this table for *planning* purposes only.

**TABLE 7-2. Timing the Software Build Upgrade**

| Upgrading Step | Expected Time Intervals | |
|---|---|---|
| | Elapsed Time | Node Outage |
| 1. Planning the Upgrade | Dependent on configuration | none |
| 2. Preparing to Upgrade | Dependent on configuration | none |
| 3. Preserving the Database | | |
| Saving to tape | 2 to 6 minutes | none |
| Storing on disk | 1 minute | none |
| Uploading to *StarKeeper* II NMS | 2 to 5 minutes | none |
| Generating a Database Report | varies | none |
| 4A. Upgrading the BNS-2000 Software to a New Build or Compatible Release | | |
| Loading the software: | | |
| single ECPU CC | 80 minutes | none |
| dual ECPU CC | 80 minutes | none |
| single CCM | 5 minutes | none |
| dual CCM | 10 to 20 minutes | none |
| Installing the software | 2 to 20 minutes | yes |
| Upgrading the database (if required) | 6 to 30 minutes | none |
| Registering the software | 2 to 5 minutes | none |
| 4B. Upgrading the *Datakit* II VCS Software to a New Build | | |
| Loading the software: | | |
| single CC | 50 minutes | none |
| dual CC | 50 minutes | none |
| Installing the software | 4 to 20 minutes | yes |
| Upgrading the database (if required) | 6 to 30 minutes | none |
| Registering the software | 2 to 5 minutes | none |
| 5. Verifying the Database Against the Original | varies | none |

### PROCEDURE 7-1. Obtaining the Software Registration Key

**Requirements:** A software registration key is needed during the final steps of upgrading.

1. Check to make sure that the information needed to register your node is up-to-date; see the appropriate table in the **Technical Assistance and Node Registration** preface.
2. At the **`CC0>`** prompt, enter **verify registration** or **dstat module** to obtain the serial number of the UN635B SCSI/DKI (ECPU system) or CCM (CCM system), usually in logical slot 78 for a BNS-2000 node or in slot 14 for a *Datakit* II VCS node.

   This number is given in the **`Node Identifier`** field, and is necessary to obtain the software registration key that makes the node operational.
3. Call 1-800-WE-2-CARE to obtain the software registration key before you start to upgrade. Write down the key in the space provided in Table 2 of the **Technical Assistance and Node Registration** preface.

## Step 2. Preparing to Upgrade

Before starting to upgrade, check the baud rate and the connection between the MRC and administration console, and disable the automatic database recovery and backup options.

---

### PROCEDURE 7-2. Disabling Automatic Recovery and Autobackup

**Application:** BNS-2000 or *Datakit* II VCS node with MRC.

**Requirements:** Disable the auto backup and recovery options before upgrading or problems will occur during the installation procedures and software upgrade.

1. To disable the automatic recovery feature: at the **`MRC>`** prompt, enter **set recovery off**.

```
MRC> set recovery off
MRC  Escape  Escape
CC0>
```

2. To disable the automatic database backup for dual disk systems: at the **`CC0>`** prompt, use the **change node** command to set *autobackup* to *off*.

### PROCEDURE 7-3. Checking the MRC–Console Connection

**Application:** BNS-2000 or *Datakit* II VCS node with administration console port A connected to the MRC.

**Requirements:** The baud rate for port A must be set to 9600 bps before upgrading, or problems will occur during the installation procedures and software upgrade. The active Control Computer must be CC0.

1. These upgrade procedures assume that the administrative console used to perform the upgrade is connected to port A of the MRC.

   If you are not sure that the console is connected to port A, see the appropriate figures in the **Node Installation** chapter for the physical location of the port A connector on the MRCM (AWJ16B I/O board) or for the physical location of the port A connector on the MRCIO.

2. If CC1 is the active Control Computer (CC1> prompt) then at the MRC prompt use the **switchover** command to force CC1 as the active Control Computer.

```
CC1> stop
. . .
LOADER> Escape Escape
MRC> switchover
. . .
CC0>
```

3. At the **MRC>** prompt, use the **dstat** command to check the current baud rate for port A.

```
CC0> Escape Escape
MRC> dstat
. . .
MRC>
```

4. If the baud rate is not 9600, enter **set a baud 9600** to configure the port A terminal.

## Step 3. Preserving the Database

Before upgrading software, the database files need to be stored off the node.

**WARNING:** For nodes with session maintenance trunks, be sure **no reroutes** are in effect before preserving the database. The upgrade will fail if you are backing up a database for a node containing rerouted session maintenance trunks; see the *Session Maintenance Guide*.

### PROCEDURE 7-4. Preserving the Database

**Application:** BNS-2000 or *Datakit* II VCS node.

**Requirements:** The required storage location is a data tape.

**Timing Note:** Backing up the database takes 2 to 6 minutes.

1. Enter the **sync** command to synchronize the database.
2. Back up the node configuration database to a blank, formatted 40MB tape or DDS tape; make sure the tape is write-enabled.
   a. Insert the tape in tape drive 0 (ECPU system) or in the internal or external tape drive (CCM system); see the appropriate figures in **Chapter 3**.

      Push the tape against the hinged flap that covers the drive opening until it snaps into place; the drive is designed to prevent improper insertion.

      When the tape is properly seated, the red or yellow LED on the drive will light for about two minutes. During this time, the drive is initializing. Any attempt to access the tape before the initialization sequence completes will fail.

   b. When the red or yellow LED goes out,

      *For an ECPU system:* enter the **backup tape 0** command.

      *For a CCM system:* enter the **backup tape 1** command.

   c. Once the backup is complete, remove the tape from the drive, and label it.
3. Optionally, using the **backup host** <*address*> command, upload a second copy of the database files to a *StarKeeper* II NMS host.

   For instructions on running the node software management tool (NDSWMGMT) to upload and download the database, see the *StarKeeper II NMS Core System Guide*.
4. Optionally, using **verify** commands, generate a database report that can be used to check the upgraded database at the conclusion of the release upgrade. See the procedure for Generating a Node Configuration Database Report.

## Step 4A. Upgrading BNS-2000 Software to a New Build or a Compatible Release

### PROCEDURE 7-5. Upgrading a BNS-2000 Software Build or a Compatible Release

**Application:** To upgrade software from one build to a newer build of the release for a single Control Computer or for dual Control Computers with a MRC.

**Requirements:** The port A baud rate should be 9600 bps. The auto backup and recovery options are set to *off* and the database has been saved to tape or host.

**Switches:** CC0: ENABL; CC1: ENABL.

1. At the **CC0>** prompt, enter **dstat cc** to verify the following:
   a. CC0 is active and the system is operating on the disk associated with CC0: disk 0.
   b. The standby Control Computer is in service and in standby mode.

2. Use the **backup active** command to copy the current database to the backup partition on the disk.

```
CC0> backup active
CC0>
```

   **NOTE:** The release software can be loaded onto the disk either from the local tape drive using steps 3 and 4 or it can be downloaded to the node via *StarKeeper* II NMS; see the *StarKeeper* II NMS documentation for specific instructions. If the software is downloaded from the *StarKeeper* system, skip steps 2 and 3 and continue this procedure at step 4 after the download is completed.

3. Insert the release tape containing the new build into tape drive 0 associated with Control Computer 0 (CC0) for the ECPU system; or into the single tape drive on the secondary SCSI bus on CC0 for the CCM system.

   Make sure the tape is write-protected.

   When the red or yellow LED goes out, continue with the next step.

4a. *For a BNS-2000 Release 3.0 ECPU system upgraded to a BNS-2000 Release 5.0 ECPU system:*

   Load the compressed file system into the standby partition of the disk (partition 3). Then, reboot the controller on the standby partition (p/3:) to the standalone shell and execute a shell script to create a new file system in the staging partition (1). The staging partition will then contain the full release and uncompressed files.

**PROCEDURE 7-5. Upgrading a BNS-2000 Software Build or a Compatible Release** (continued)

Use the following command sequence to load the software release to disk.

**NOTE:** The **diskcopy** command copies the compressed release into the standby partition and executes for about 30 to 40 minutes. The **setuprel** command creates a new file system in the staging partition of the disk, copies all the release files to the new file system and uncompresses the compressed files. This command executes for about 30 minutes.

```
CC0> utilsh
UTILITY> diskcopy -e
> tp/b0t3p1 rdskp3
. . .
>  Control  -  D
UTILITY> stop
Are you sure? y
. . .
LOADER> run p/3:
. . .
UTILITY> setuprel
. . .
UTILITY> reboot
Are you sure? y
. . .
CC0>
```

4b. *For a BNS-2000 Release 4.0 to a BNS-2000 Release 5.0 ECPU or CCM system:*

Load the release from the tape to the Control Computer using the following **loadrel** command, as shown in the following screen.

This command will prompt you to specify the Control Computer and the tape drive containing the release tape; specify **0** for an ECPU system tape drive, and **1** for a CCM system tape drive.

**PROCEDURE 7-5. Upgrading a BNS-2000 Software Build or a Compatible Release** (continued)

```
CC0> utilsh
MINI-SH: What can I do for you?
UTILITY> loadrel
Which controller is active (0 or 1, q to quit)? 0
Which tape drive contains the release tape (0 or 1, q to quit)? 1
Which kind of system: CCM or ECPU (c or e, q to quit)? c
. . .
The new release is ready to be installed.
UTILITY> exit
CC0>
```

**NOTE:** The **loadrel** command will execute for about 30 minutes (ECPU system) or 5-10 minutes (CCM system) as it copies the release from the tape to the staging partition of the disk.

5. Use the **backup active** command to copy the current database to the backup partition on the disk.

```
CC0> backup active
CC0>
```

6. Use the **dstat cc** command to verify that the release has been loaded into the staging partition and there is a backup in the **backup area**.
7. To boot the system from the new release, enter the **install release** command.

```
CC0> install release
CC0>
```

**NOTE:** The **install release** command takes 2 to 20 minutes depending on the number of modules that must be downloaded when new software is installed.

   a. If a database upgrade is not required, the node automatically copies the software to both disks, boots from the new release, and returns the **CC0>** prompt to the screen.

   b. If a database upgrade is required, the node boots to the standalone utility shell. To convert the database, enter the **dbupgrd** command. Then reboot the node, typing **y** for

**PROCEDURE 7-5. Upgrading a BNS-2000 Software Build or a Compatible Release** (continued)

*yes* when prompted.

**NOTE:** If required, the **dbupgrd** command will take an additional 6 to 30 minutes to complete depending on the size of the database.

```
UTILITY> dbupgrd
. . .
UTILITY> reboot
Are you sure? yes
. . .
CC0>
```

**NOTE:** If **dbupgrd** fails, reboot the node on the original release until the problem can be corrected using the **install backout** command; see the procedure for Backing Out of a Software Build Upgrade on an Operational Node.

8. When the node has rebooted, use the **install registration** command procedure in the **Node Operations** chapter to register the release software.

   **CAUTION:** In a dual Control Computer node, each controller may have to be registered separately, using the same software key, when the **install release** command is used.

9. In a dual Control Computer node, use the **change node** command to set auto backup to *on*.
10. Update the database backup on disk 0 to preserve the node registration and save the database.

```
CC0> sync
CC0> backup save 0
. . .
CC0>
```

11. Check the time using the **display time** command. If necessary, use the **set time** command to reset the time for Control Computer 0 (CC0), as follows.

**PROCEDURE 7-5. Upgrading a BNS-2000 Software Build or a Compatible Release** (continued)

```
CC0> set time
TIME[HHMMSS] +(211109):
DATE[YYMMDD] +(960130):
CC0>
```

12. *For a dual Control Computer system,* reconnect to port M to enable automatic recovery.

```
CC0>  Escape  Escape
MRC> set recovery on
. . .
MRC>  Escape  Escape
CC0>
```

13. Use the **verify node** command to verify that the new release and build is active on the node.
14. Remove the release tape from the tape drive.

*This completes the upgrade from one software build to another.*

## Step 4B. Upgrading the *Datakit* II VCS Software to a New Build

### PROCEDURE 7-6. Upgrading a *Datakit* II VCS Software Build

**Application:** To upgrade software from one build to a newer build of the release for a single Control Computer or for dual Control Computers with a MRC.

**Requirements:** The port A baud rate should be 9600 bps. The auto backup and recovery options are set to *off* and the database has been saved to tape or host.

**Switches:** CC0: ENABL; CC1: ENABL.

1. At the **CC0>** prompt, enter **dstat cc** to verify the following:
   a. CC0 is active and the system is operating on the disk associated with CC0: disk 0.
   b. The standby Control Computer is in service and in standby mode.

2. Use the **backup active** command to copy the current database to the backup partition on the disk.

```
CC0> backup active
CC0>
```

   **NOTE:** The release software can be loaded onto the disk either from the local tape drive using steps 3 and 4 or it can be downloaded to the node via *StarKeeper* II NMS; see the *StarKeeper* II NMS documentation for specific instructions. If the software is downloaded from the *StarKeeper* system, skip steps 3 and 4 and continue this procedure at step 5 after the download is completed.

3. Insert the release tape containing the new build into tape drive 0 associated with Control Computer 0 (CC0) for the ECPU system; or into the single tape drive on SCSI bus 1 for the CCM system.

   Make sure the tape is write-protected.

   When the red or yellow LED goes out, continue with the next step.

4. Load the release from the tape to the Control Computer using the following **loadrel** command, as shown in the following screen.

   This command will prompt you to specify the Control Computer and the tape drive containing the release tape; specify **0** for an ECPU system tape drive, and **1** for a CCM system tape drive.

**PROCEDURE 7-6. Upgrading a *Datakit* II VCS Software Build** (continued)

```
CC0> utilsh
MINI-SH: What can I do for you?
UTILITY> loadrel
Which controller is active (0 or 1, q to quit)? 0
Which tape drive contains the release tape (0 or 1, q to quit)? 1
Which kind of system: CCM or ECPU (c or e, q to quit)? c
. . .
The new release is ready to be installed.
UTILITY> exit
CC0>
```

**NOTE:** The **loadrel** command will execute for about 30 minutes (ECPU system) or 5 minutes (CCM system) as it copies the release from the tape to the staging partition of the disk.

5. Use the **dstat cc** command to verify that the release has been loaded into the staging partition.
6. To boot the system from the new release, enter the **install release** command.

```
CC0> install release
CC0>
```

**NOTE:** The **install release** command takes 2 to 20 minutes depending on the number of modules that must be downloaded when new software is installed.

   a. If a database upgrade is not required, the node automatically copies the software to both disks, boots from the new release, and returns the **CC0>** prompt to the screen.

   b. If a database upgrade is required, the node boots to the standalone utility shell. To convert the database, enter the **dbupgrd** command. Then reboot the node, typing **y** for *yes* when prompted.

      **NOTE:** If required, the **dbupgrd** command will take an additional 6 to 30 minutes to complete depending on the size of the database.

**PROCEDURE 7-6. Upgrading a *Datakit* II VCS Software Build** (continued)

```
UTILITY> dbupgrd
. . .
UTILITY> reboot
Are you sure? yes
. . .
CC0>
```

**NOTE:** If **dbupgrd** fails, reboot the node on the original release until the problem can be corrected using the **install backout** command; see the procedure for Backing Out of a Software Build Upgrade on an Operational Node.

7. When the node has rebooted, use the appropriate procedure in **Chapter 3** to to register the release software.

   **CAUTION:** In a dual Control Computer node, each controller will have to be registered separately, using the same software key, when the **install release** command is used.

8. Use the **change node** command to set auto backup to *on*.
9. Update the database backup on disk 0 to preserve the node registration and save the database.

```
CC0> sync
CC0> backup save 0
. . .
CC0>
```

10. Check the time using the **display time** command. If necessary, use the **set time** command to reset the time for Control Computer 0 (CC0), as follows.

```
CC0> set time
TIME[HHMMSS] +(211109):
DATE[YYMMDD] +(960130):
CC0>
```

11. *For a dual Control Computer system,* reconnect to port M to enable automatic recovery.

**PROCEDURE 7-6. Upgrading a *Datakit* II VCS Software Build** (continued)

```
CC0>  Escape  Escape
MRC>  set recovery on
. . .
MRC>  Escape  Escape
CC0>
```

12. Use the **verify node** command to verify that the new release and build is active on the node.
13. Remove the release tape from the tape drive.

*This completes the upgrade from one software build to another.*

## Step 5. Verifying the Database Against the Original

Optionally, generate a database report; see the procedure provided. Compare it to the database report generated prior to the database upgrade. Correct any differences using administrative commands; see Verifying the Database in **Node Administration**.

# Backing Out of a Software Build Upgrade

At times, problems may arise when upgrading system software. Backing out of an upgrade using the **install backout** command allows you to switch back to the release or build prior to the upgrade, until the problems can be corrected.

The node must be operational on the new release to use the **install backout** command. This command reboots the node on the previous release that is in the staging partition of the disk and uses either the database that was in the release partition prior to the upgrade or the database archive that is in the backup area on the disk.

Use the following procedure to back out of a software upgrade.

---

### PROCEDURE 7-7. Backing Out of a Software Build Upgrade on an Operational Node

**Application:** Any BNS-2000 Release 3.0 or higher (cannot back out to, or from, a release lower than 3.0) or any *Datakit* II VCS Release 5.0 or Release 6.0 configuration.

**Requirements:** The port A baud rate should be 9600 bps.

**Switches:** CC0: ENABL; CC1: ENABL.

1. At the **`CC0>`** prompt, enter **dstat cc** to verify the following:
   a. CC0 is active and the system is operating on the disk associated with CC0: disk 0.
   b. The standby Control Computer is in service and in standby mode.
   c. The main partition on the active disk contains the newer software release.
   d. The staging partition of the active disk contains the older software version (lower build number).
   e. The node is accessed via a console connected to port A of the MRC or from port M of the MRC.

2. Use the **verify node** command to see if the auto backup feature is *off*.

   If it is *on*, use the **change node** command to turn auto backup *off* and the **sync** command to write the database to disk.

**PROCEDURE 7-7. Backing Out of a Software Build Upgrade on an Operational Node** (continued)

3. Use the following command sequence to disable automatic switchover.

```
CC0>  Escape  Escape
MRC>  set recovery off
. . .
MRC>
```

4. Run **install backout** to return the node to the previous software build and type **y** for *yes* to continue the backout process.

```
CC0>  install backout
. . .
INFO:  Backing out from Rel <old num>  Build <old num>  to Rel <new num>
"CV "            Build <new num>."
CONTINUE BOOT PROCESS [no, yes: +(no)]:  yes
. . .
CC0>
```

5. Now set recovery on.

```
CC0>  Escape  Escape
MRC>  set recovery on
. . .
MRC>  Escape  Escape
CC0>
```

*This completes the software backout procedure on an operational node.*

# Upgrading to a New Release—General Method

The following steps present the basic sequence of tasks for upgrading a BNS-2000 Release 1.2, 2.0, 3.0, or 4.0 node to Release 5.0; or a *Datakit* II VCS Release 3.0, 3.1, 4.0, 5.0, or a BNS-1000 Release 1.1 and 2.0 to *Datakit* II VCS Release 6.0.

**TABLE 7-3. New Release Upgrade–General Method Checklist**

| √ | Steps | Explanation |
|---|---|---|
| | 1. Planning the Upgrade | The equipment and software must be available, configuration decisions made, and a new software registration key obtained before upgrading can begin. |
| | 2. Preparing to Upgrade | The auto backup and recovery options must be disabled. |
| | 3. Preserving the Database | The configuration database must be stored where it can be retrieved operationally, for normal operations or in case of difficulties. See the procedure for Preserving the Database. A report copy of the database should be generated. |
| | 4A/4B. Upgrading the Hardware<br>CPU to ECPU<br>CPU to CCM<br>ECPU (old disk) to ECPU<br>ECPU to CCM<br>Standard to Extended Switch Complex | 4A. BNS-2000 Release 5.0 requires either an ECPU controller and a disk hardware upgrade (if the node is running Release 2.0 or earlier releases), or a new CCM and a DDS tape drive, which are installed *after* the existing database is preserved.<br>Also, BNS-2000 Release 5.0 Series M2 Switch Shelves running with CCM or ECPU systems can function with a standard or extended switch complex.<br>4B. *Datakit* II VCS Release 6.0 requires an ECPU controller and a disk hardware upgrade (if the node is running Release 4.0 or earlier), or a new CCM and a DDS tape drive, which are installed *after* the existing database is preserved. |
| | 5A/5B. Upgrading the Software to a New Release<br>Installing the New Disk(s)<br>Loading the Software<br>Retrieving the Database<br>Upgrading the Database<br>Rebooting the Node<br>Registering the Software | The software is installed as required; see procedures in this chapter.<br>The database is retrieved from tape.<br>The BNS-2000 database is converted to Release 5.0 (Step 5A). When the node reboots, service is available for Release 5.0.<br>The *Datakit* II VCS database is converted to Release 6.0 (Step 5B). When the node reboots, service is available for Release 6.0. |
| | 6. Verifying the Database Against the Original | In this optional step, the report copy of the database is compared to the results of new reports to ensure that all of the installed trunks and modules are equivalent to the original capability. This step completes the upgrade process. |

## Step 1. Planning the Upgrade

The BNS-2000 or *Datakit* II VCS upgrade must be planned to ensure that all the equipment is available to complete the upgrade. The software and tapes must also be available, as well as sufficient staff and node outage time to perform the upgrade. General information on equipment handling, tools, and preparation can be found in **Node Installation**.

Before starting any upgrade procedures, assemble all the items listed in the following table.

**TABLE 7-4. Upgrade Equipment Checklist**

| √ | Equipment | Explanation |
|---|---|---|
| | *StarKeeper* II NMS, Release 9.0 | If *StarKeeper* II NMS is monitoring the node to be upgraded, make sure it is running Release 9.0. |
| | *Datakit* II VCS software release tape (Release 6.0)<br>BNS-2000 software release tape (Release 5.0) | |
| | Red Feature card for each feature package ordered | |
| | Formatted, blank tape (ECPU)<br>Blank DDS tape (CCM) | To back up the database when the upgrade is complete.<br>For a BNS-2000 Release 5.0 or<br>a *Datakit* II VCS Release 6.0<br>build-to-build upgrade. |
| | New modules to be installed | See the table on Control Computer Hardware and the procedures for your configuration under the step for Upgrading the Hardware. |
| | New I/O boards to be installed | See the table on Control Computer Hardware and the procedures for your configuration under the step for Upgrading the Hardware. |
| | New cables to be installed | See the table on Control Computer Hardware. |
| | Working Tape Drive (TN2097) | If the tape drive has not been used recently, make sure it is working properly by making a database backup tape ahead of time. |
| | ESD wrist strap | Must be properly grounded |
| | 3- and 12-inch flat blade screwdrivers | |
| | Small/large Phillips-head screwdrivers | |
| | Socket driver | |
| | 1/8" Nut Driver | Supplied with ECPU to CCM upgrade kit |
| | Slot address labels for new modules | Check the label sheets supplied with your node cabinet and with any new modules. |

The following table gives an approximate time for each step and an indication of node outage, if applicable. Use this table for *planning* purposes only.

**TABLE 7-5. Timing the Upgrade**

| Upgrading Step | Expected Time Intervals | |
|---|---|---|
| | Elapsed Time | Node Outage |
| 1. Planning the Upgrade | Dependent on configuration | none |
| 2. Preparing to Upgrade | Dependent on configuration | none |
| 3. Preserving the Database | | |
| Saving to tape | 2 to 6 minutes | none |
| Storing on disk | 1 minute | none |
| Uploading to *StarKeeper* II NMS | 2 to 5 minutes | none |
| Generating a Database Report | varies | none |
| 4A. Upgrading the BNS-2000 Hardware: | | |
| ECPU system to 540MB disk | 5 to 15 minutes | none |
| ECPU system to CCM system | 20 to 60 minutes | yes |
| standard to extended switch | ? minutes | yes |
| 4B. Upgrading *Datakit* II VCS Hardware: | | |
| CPU system to CCM system | 20 to 60 minutes | yes |
| CPU system to ECPU system | 20 to 60 minutes | yes |
| ECPU system to 540MB disk | 5 to 15 minutes | none |
| ECPU system to CCM system | 20 to 60 minutes | yes |
| 5A. Upgrading the BNS-2000 Software to a New Release: | | |
| Loading the software | | |
| single CC | 80 minutes (ECPU)/5 minutes (CCM) | yes |
| dual CC | 90 minutes (ECPU)/8 minutes (CCM) | yes |
| Retrieving the database from tape storage | 4 to 6 minutes | yes |
| Upgrading the database | 6 to 30 minutes | yes |
| Copying the software to other disk partitions | 2 to 20 minutes | yes |
| Rebooting the node | 4 to 20 minutes | yes |
| Registering the software | 2 to 5 minutes | yes |

**TABLE 7-5. Timing the Upgrade** (continued)

| Upgrading Step | Expected Time Intervals | |
|---|---|---|
| | Elapsed Time | Node Outage |
| 5B. Upgrading the *Datakit* II VCS Software to a New Release: | | |
| Loading the software | | |
| single CC | 50 minutes (ECPU)/5 minutes (CCM) | yes |
| dual CC | 60 minutes (ECPU)/8 minutes (CCM) | yes |
| Retrieving the database from tape storage | 4 to 6 minutes | yes |
| Upgrading the database | 6 to 30 minutes | yes |
| Copying the software to other disk partitions | 4 to 20 minutes | yes |
| Rebooting the node | 4 to 20 minutes | yes |
| Registering the software | 2 to 5 minutes | yes |
| 6. Verifying the Database Against the Original | varies | none |

## PROCEDURE 7-8. Obtaining the Software Registration Key

**Requirements:** A software registration key is needed during the final steps of upgrading.

1. Check to make sure that the information needed to register your node is up-to-date; see the appropriate table in the **Technical Assistance and Node Registration** preface.
2. This serial number or ID of the node, also called the **`Node Identifier,`** is required to obtain the software registration key that makes the node operational.

   *For a Datakit II VCS CPU or ECPU to Release 6.0 CCM system:* obtain the ID from the CCM board; see illustration of the board in the **Technical Assistance and Node Registration** preface.

   *For a BNS-2000 ECPU to Release 5.0 ECPU system or a Datakit* II VCS ECPU to Release 6.0 ECPU system: at the **`CC0>`** prompt, enter **verify registration** or **dstat module** to obtain the serial number of the SCSI/DKI module (UN635B), usually in logical slot 78.

   *For a Datakit II VCS CPU to Release 6.0 ECPU system:* if the existing SCSI/DKI module is a UN635, it must be replaced as part of the hardware upgrade procedures. Obtain the node ID from the new SCSI/DKI module (UN635B) before it is placed in the node; see illustration of the board **Technical Assistance and Node Registration** preface.
3. Call 1-800-WE-2-CARE to obtain the software registration key before you start to upgrade. Write down the key in the space provided in Table 2 of the **Technical Assistance and Node Registration** preface.

## Step 2. Preparing to Upgrade

Before starting the BNS-2000 or *Datakit* II VCS upgrade, connect the console to CC0, check the baud rate and the connection between the MRC and the administration console, and disable the automatic recovery and database auto backup options.

If a *Datakit* II VCS node is to use redundant Eswitch modules, any module except an Eswitch that occupies slot 2 in shelf 0 must be removed and deleted. **Also, if a redundant controller is to be added, the slot for it must be empty in the database.**

---

### PROCEDURE 7-9. Disabling Automatic Recovery and Autobackup

**Application:** Node with MRC.

**Requirements:** Disable the auto backup and recovery options before upgrading or problems will occur during the installation procedures and software upgrade.

1. To disable the automatic recovery feature: at the **`MRC>`** prompt, enter **set recovery off**.

```
MRC> set recovery off
MRC  Escape  Escape
CC0>
```

2. To disable the automatic database backup for dual disk systems: at the **`CC0>`** prompt, use the **change node** command to set *autobackup* to *off*.

---

### PROCEDURE 7-10. Checking the MRC–Console Connection

**Application:** Node with administration console port A connected to the MRC.

**Requirements:** The baud rate for port A must be set to 9600 bps before upgrading, or problems will occur during the installation procedures and software upgrade. The active Control Computer must be CC0.

1. These upgrade procedures assume that the administrative console used to perform the upgrade is connected to port A of the MRC.

   If you are not sure that the console is connected to port A, see the appropriate figures in the **Node Installation** chapter for the physical location of the port A connector on the MRCM (AWJ16B I/O board) or for the physical location of the port A connector on the MRCIO.

**PROCEDURE 7-10. Checking the MRC–Console Connection** (continued)

2. If CC1 is the active Control Computer (CC1> prompt) then at the MRC prompt use the **switchover** command to force CC0 to be the active Control Computer.

```
CC1> stop
. . .
LOADER> Escape Escape
MRC> switchover
. . .
CC0>
```

3. At the **MRC>** prompt, use the **dstat** command to check the current baud rate for port A.

```
CC0> Escape Escape
MRC> dstat
. . .
MRC>
```

4. If the baud rate is not 9600, enter **set a baud 9600** to configure the port A terminal.

---

**PROCEDURE 7-11. Disabling Automatic Recovery and Backup**

**Application:** *Datakit* II VCS node with MRC.

**Requirements:** The auto backup and recovery options must be disabled prior to upgrades or problems will occur during the installation procedures and software upgrade.

1. To disable the automatic recovery feature: at the **MRC>** prompt, enter **set recovery off**.

```
MRC> set recovery off
MRC> Escape Escape
CC0>
```

2. *For a CCM system or an ECPU system using dual disks:* to disable the automatic database backup feature, at the **CC0>** prompt, use the **change node** command to set auto backup to *off*.

### PROCEDURE 7-12. Preparing for a Redundant Eswitch Module

**Application:** *Datakit* II VCS node that will be using redundant Eswitch modules.

Dual Control Computers are shipped with redundant Eswitch modules. A single Control Computer is shipped with a single Eswitch module.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules or I/O boards.

1. Physically remove any module in slot 2 of node cabinet/shelf 0 and its I/O board.
2. Place the module in another slot and connect its I/O board.
3. To re-administer the module in the database, follow step a or b:
   a. Use the **move** <*module*> command to move the module to a different slot; or
   b. Use the **delete** <*module*> command to remove the module from its current address in the database and then use the **enter** <*module*> command.
4. Enter the **sync** command to synchronize the database.

## Step 3. Preserving the Database

Before upgrading software, the database files need to be stored off the node.

**WARNING:** For nodes with session maintenance trunks, be sure **no reroutes** are in effect before preserving the database. The upgrade will fail if you are backing up a database for a node containing rerouted session maintenance trunks; see the *Session Maintenance Guide*.

---

### PROCEDURE 7-13. Preserving the Database

**Application:** A BNS-2000 ECPU system to be upgraded to Release 5.0 or a *Datakit* II VCS CPU/ECPU system to be upgraded to Release 6.0.

**Requirements:** The required storage location is a data tape. For tape drives on *Datakit* II VCS nodes, the tape drive should be cleaned prior to this procedure; see the appropriate procedures in **Chapter 5**.

**Timing Note:** Backing up the database takes 2 to 6 minutes.

1. Enter the **sync** command to synchronize the database.
2. For a BNS-2000 node, back up the node configuration database to a blank, formatted 40MB tape or DDS tape; make sure the tape is write-enabled.

   For a *Datakit* II VCS node, back up the configuration database to a blank, formatted 40MB tape; make sure the tape is write-enabled (the write-protect slide should be in the RECORD position).

   **NOTE:** Later, during the software upgrade for a CCM system, you will use the old tape drive and this tape to initialize the CCM database.

   a. Insert the tape in tape drive 0; see the appropriate figures in **Chapter 3**.

      Push the tape against the hinged flap that covers the drive opening until it snaps into place; the drive is designed to prevent improper insertion.

      When the tape is properly seated, the red or yellow LED on the drive will light for about two minutes. During this time, the drive is initializing. Any attempt to access the tape before the initialization sequence completes will fail.

**PROCEDURE 7-13. Preserving the Database** (continued)

b. When the red LED goes out, enter the **backup tape 0** command.

c. Once the backup is complete, remove the tape from the drive, and label it.

3. Optionally, using the **backup host** <*address*> command, upload a second copy of the database files to a *StarKeeper* II NMS host.

   For instructions on running the node software management tool (NDSWMGMT) to upload and download the database, see the *StarKeeper II NMS Core System Guide*.

4. Optionally, using **verify** commands, generate a database report that can be used to check the upgraded database at the conclusion of the release upgrade. See the procedure for Generating a Node Configuration Database Report.

## Step 4A. Upgrading the BNS-2000 Hardware

This section outlines the general steps to upgrade BNS-2000 hardware. It then gives specific procedures for directly upgrading a node to the new release. The following node hardware configurations can be converted for Release 5.0:

- ECPU system to CCM system
- ECPU system (old disk) to ECPU system (TN2175B disk)
- Standard Switch Complex to Extended Switch Complex

**NOTE:** When upgrading a BNS-2000 Release 3.0 or Release 4.0 ECPU system to a Release 5.0 ECPU system, hardware upgrades are unnecessary. The system has the new disk (TN2175B). For this upgrade scenario, skip to Step 5A, Upgrading the BNS-2000 Software to a New Release.

Control Computer modules, associated I/O boards, and cables must be replaced by Release 5.0 components.

The following tables compare the modules used in previous systems to those required for the new release.

**TABLE 7-6. BNS-2000 Control Computer Hardware**

| Modules and I/O Boards in BNS-2000 Node Shelf | | |
|---|---|---|
| **Pre-Release 5.0 ECPU System** | **Release 5.0 ECPU System** | **Release 5.0 CCM System** |
| ECPU (MC1D138A1)<br>AWJ15 | ECPU (MC1D138A1)<br>AWJ15 | CCM (TN2235)<br>CTS2* |
| SCSI/DKI (UN635B)<br>ASP4/ASP4B | SCSI/DKI (UN635B)<br>ASP4B | —<br>— |
| Disk (TN2175/TN2175B)<br>AWJ12 | Disk (TN2175B)<br>AWJ12 | on CCM<br>— |
| Tape (TN2097)<br>ASP8 | Tape (TN2097)<br>ASP8 | DDS Tape (TN2233)<br>CSD9 |
| | | DDS Tape (external)**<br>(ED3P325-30,G407) |
| M-bus cable<br>(843243833) | M-bus cable<br>(843243833) | ABM cable (MRC)<br>AB cable (no MRC) |
| MRCM (TN2109/<br>TN2109B/TN2109C)<br>AWJ16B | MRCM (TN2109C)<br>AWJ16B | MRCIO<br>CTS1 |
| SCSI-Local cable | SCSI-Local cable | 2 SCSI cables (MRC) |
| SCSI-Short cable | SCSI-Short cable | A1B1C1 cable (MRC) |
| SCSI-Remote cable | SCSI-Remote cable | power cable (MRC) |

* This I/O board provides no MRC functionality.

** To retrieve the old database, you must have an AWJ12 or a new CSD9 I/O board.

**TABLE 7-7. BNS-2000 Series M2 Switch and Stratum 4 Clocking Complexes for CCM or ECPU Systems**

| Function | Pre-Release 5.0 0-3 Series M2 Extension Shelves and SSM4 Clocking | Release 5.0 0-3 Series M2 Extension Shelves and SSM4 Clocking | Release 5.0 more than 3 Series M2 Extension Shelves and STR4 Clocking |
|---|---|---|---|
| Switching and Clocking* | CMA1 module board<br>CNA1 I/O board<br>CMC3 I/O board | CMA1 module board<br>CNA1 I/O board<br>CMC3 I/O board | CTG13 module board<br>CNA7 I/O board<br>CUW1 RIB I/O |
| Extension Shelf Clock/Cable | CNA2 I/O board | CNA2 I/O board | CNA8 I/O board |

* Functions can be made redundant.

### PROCEDURE 7-14. General Procedure for Upgrading BNS-2000 Control Computer and Disk Hardware

**Application:** These steps apply to all procedures in this chapter for upgrading node Control Computer and disk hardware.

See the Node Module and I/O Board Installation section in **Node Installation** for more information on handling hardware, setting switches on modules, and cabling the Control Computer configurations.

**NOTE:** The following steps are not executed here, but within the procedures that follow.

- Power down the control cabinet.
- Remove the control complex modules.
- Remove the cables from the control complex I/O boards.
- Remove the control complex I/O boards.
- Insert the new control complex I/O boards.
- Connect the cables on the new control complex I/O boards.
- Insert the new control complex modules.
- Power up the control complex cabinet.
- Run firmware diagnostics on the new Control Computer components.

Choose the procedure that is appropriate for your equipment, and begin the hardware upgrade:

- ECPU System to Release 5.0 CCM System
- ECPU System to Release 5.0 ECPU system

### PROCEDURE 7-15. BNS-2000 ECPU System to Release 5.0 CCM System

**Application:** To upgrade the BNS-2000 ECPU system in a Series M1 Shelf to a BNS-2000 Release 5.0 CCM system.

**Switches:** CC0: DIAG; CC1: DIAG.

**Requirements:** Preserve the existing database before starting the upgrade; see the procedure for Preserving the Database.

This procedure should be followed by the procedure for Upgrading a BNS-2000 Software Release: Single Control Computer or the procedure for Upgrading a BNS-2000 Software Release: Dual Control Computer.

**CAUTION:** Wear a properly grounded ESD wrist strap when handling modules and I/O boards.

1. Enter the following command sequence to bring down the Control Computer.

```
CC0> stop
*** Trying To Boot From Primary Disk ***
A RECOVERY REBOOT
 Reason: SOFTWARE INITIATED BY ADMINISTRATOR
TYPE ? for help
LOADER> monitor
*** DKC Loader Monitor 3.0.1 ***
. . .
MONITOR>
```

2. *For a dual Control Computer system only:* enter the following command sequence to stop the standby Control Computer.

```
MONITOR> [Escape] [Escape]
MRCM> connect standby
SC1> stop
. . .
LOADER> mon
MONITOR>
```

3. Move the controller mode switch for CC0 and CC1 to the DISAB position.
4. Power down the node.

**PROCEDURE 7-15. BNS-2000 ECPU System to Release 5.0 CCM System** (continued)

5. First, remove the Control Computer modules from the front of the shelf, and then the cables and the I/O boards from the back of the shelf, as indicated in the following table.

| ECPU System to BNS-2000 Release 5.0 CCM System Modular Cabinet—Modules and I/O Boards Removed | | | | |
|---|---|---|---|---|
| Logical Slot Number | | Type | Module | I/O Board |
| Shelf 4 | Shelf 5 | | | |
| 71 | — | MRCM | TN2109 | AWJ16B |
| 77 | 93 | ECPU | MC1D138A1 | AWJ15 |
| 78 | 94 | SCSI/DKI | UN635B | ASP4B |
| 75 | 91 | Disk | TN2175B | AWJ12* |
| 73 | 89 | Tape | TN2097 | ASP8B |
| * If using an external tape drive, save the AWJ12 until the database is retrieved. | | | | |

**NOTE:** Keep the old 40MB tape drive at hand because you will use it later to retrieve the database.

If you have an external tape drive, leave the AWJ12 I/O board in the node until later to use when retrieving the database.

Check to make sure that the 40MB tape drive has the terminating resistors installed. If the bus termination resistors are not installed, use the ones that are provided in the upgrade kit.

All the other modules and I/O boards can be packaged for recycling.

6. Insert the new I/O boards and modules, as indicated in the following table, using the steps that follow.

**NOTE:** Always insert the I/O boards first.

**PROCEDURE 7-15. BNS-2000 ECPU System to Release 5.0 CCM System** (continued)

| ECPU System to BNS-2000 Release 5.0 CCM System<br>Modular Cabinet—Modules and I/O Boards Installed | | | | |
|---|---|---|---|---|
| **Logical Slot Number** | | **Type** | **Module** | **I/O Board** |
| **Shelf 4** | **Shelf 5** | | | |
| 75-76 | — | Tape (internal)* | TN2233 | CSD9 |
| — | — | Tape (external) | ED3P325-30,G407 | |
| 77** | 93** | CCM | TN2235 | CTS1 (MRCIO)*<br>CTS2 (no MRC) |
| 78** | 94** | CCM | TN2235 | CTS1 (MRCIO)*<br>CTS2 (no MRC) |
| * The internal tape drive can go in any two slots, depending on the cable length.<br>A dual CCM system uses both CTS1 and CTS2; a single CCM system uses one or the other.<br>** Any *magic* slot in the node may be used for the controller: for example, 29, 30, 45, 46. | | | | |

7. Insert a CSD9 I/O board in the slot behind where the tape drive will reside; for example, in logical slot 76.
8. Insert the new internal tape drive in its designated slot in front of the CSD9. The tape drive overlaps one additional slot; for example, logical slot 75, if the module is placed in logical slot 76.
9. *For a single CCM system:* Insert either the CTS1 (MRCIO) or CTS2 (no MRC) I/O board for the new CCM behind logical slots 77 or 78.

   *For a dual CCM system:*

   Insert the CTS1 (MRCIO) and the CTS2 I/O boards for the new CCMs. For two CCMs in the same cabinet, use logical slots 77 and 78.

   For example: In a node with empty slots and no I/O boards in logical slots 77 and 78, insert a CTS1 (MRCIO) into the back of logical slot 77, and a CTS2 (no MRC) in the back of logical slot 78.

   For two CCMs in adjacent cabinets, use logical slots 78 and 94.

   For example: In a node with empty slots and no I/O boards in logical slots 78 and 94, insert a CTS1 (MRCIO) into the back of logical slot 78, and a CTS2 in the back of logical slot 94.

   Cable the two I/O boards together, starting with the power port of the CTS1 and working up to the top (see the appropriate figures in the *Node Installation* chapter), as follows:

   a. Connect the PWR-MOL cable from the power port of the CTS1 to the power port of the CTS2.

**NOTE:** Do **not** over-tighten when doing steps b. and c.

b. Using the 1/8" Nut Driver supplied with the upgrade kit, install the SCSI-SK or SCSI-SK-S cable onto the Secondary SCSI port of the CTS1 and secure.

c. Install the I Tape or X Tape cable onto the stackable connector of the Secondary SCSI port of the CTS1 and secure.

d. Install the other end of the SCSI-SK or SCSI-SK-S cable onto the Primary SCSI port of the CTS2 and secure.

e. Install the other end of the I Tape or X Tape cable onto the CSD9 or the external tape drive, and secure.

f. Connect the A1B1C1 cable from the A1B1C1 port of the CTS1 to the A1B1C1 port of the CTS2.

g. Connect the ABM cable to the CTS1.

h. Connect the cable from the Primary SCSI Port of the CTS1 to the Secondary SCSI Port of the CTS2.

**NOTE:** When removing these cables, reverse the order.

i. Connect the console to the A port of the ABM cable.

10. Power up the node.

11. *For a single CCM system:*

a. With the CCM controller mode switch in the DISAB position, insert the CCM module into the selected slot; wait approximately 5 seconds for the disk drive to spin up and set the controller mode switch to the DIAG position.

b. If using CTS1, connect the ABM cable to ports A, B, and M; if using CTS2, connect the AB cable to ports A and B.

c. Check that port A displays the **`MONITOR>`** prompt.

*For a dual CCM system:*

a. With the CCM controller mode switch in the DISAB position, insert the first CCM (0) into the selected slot; wait approximately 5 seconds for the disk drive to spin up, and set the controller mode switch in the DIAG position.

b. With the CCM controller mode switch in the DISAB position, insert the second CCM (1) into the selected slot; wait approximately 5 seconds for the disk drive to spin up, and set the controller mode switch in the DIAG position.

c. Connect the ABM cable to ports, A, B, and M.

d. Check that port M displays the **`MRC>`** prompt and that port A displays the **`MONITOR>`**

prompt.

12. To cable the tape drive:

    *For a single CCM system:* Cable the tape drive to SCSI bus 1 (bottom connector on CTS1 or CTS2).

13. Verify that the new modules are in the correct slots for your system; see the appropriate figures in this chapter.

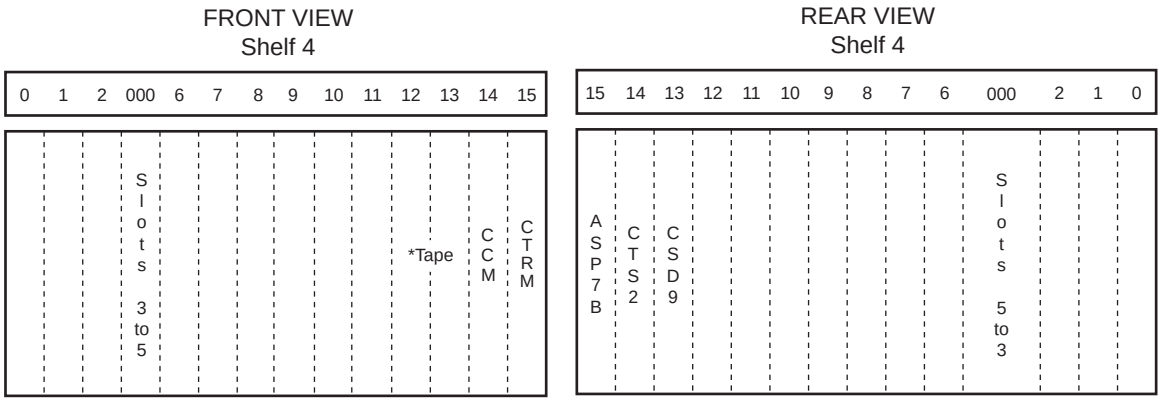
14. When you have finished installing the new components, apply the address and slot labels supplied with the new equipment.

    *This completes the hardware installation for a CCM system.*

15. Go to the procedure for Verifying the Control Computer and Disk Hardware Installation.

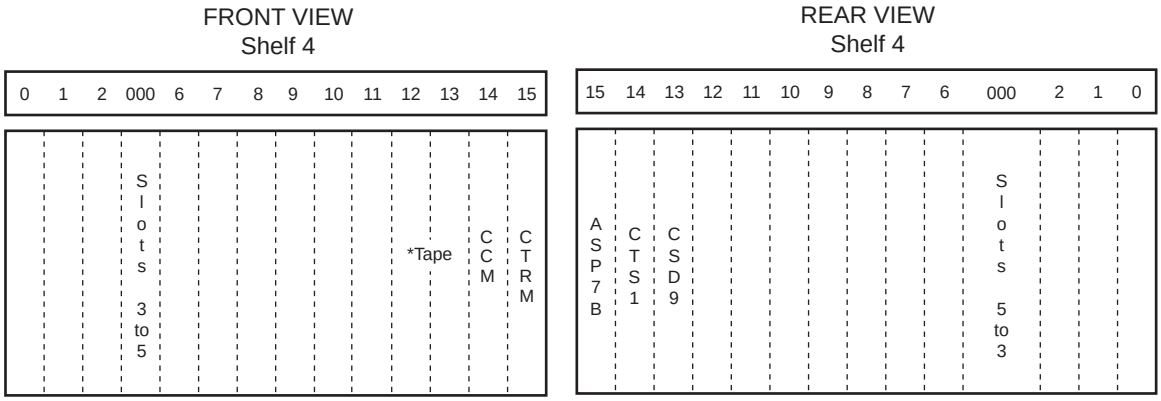
    After verifying the installation, continue with Step 5A, Upgrading the BNS-2000 Software to a New Release, and choose the appropriate procedure for your system.

The following figures depict the various Release 5.0 CCM configurations.



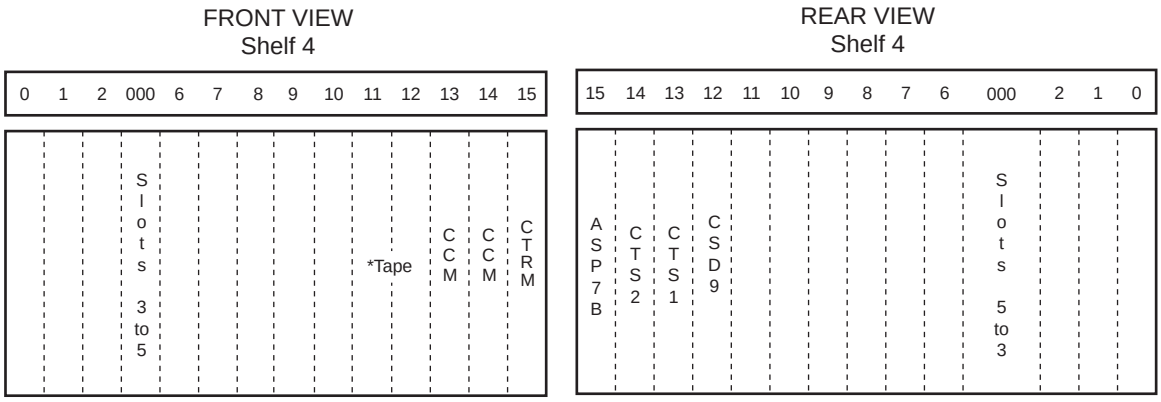

* Tape can be external or in any slot, depending on cable length.

**FIGURE 7-1. BNS-2000 Single CCM System Without MRCIO**



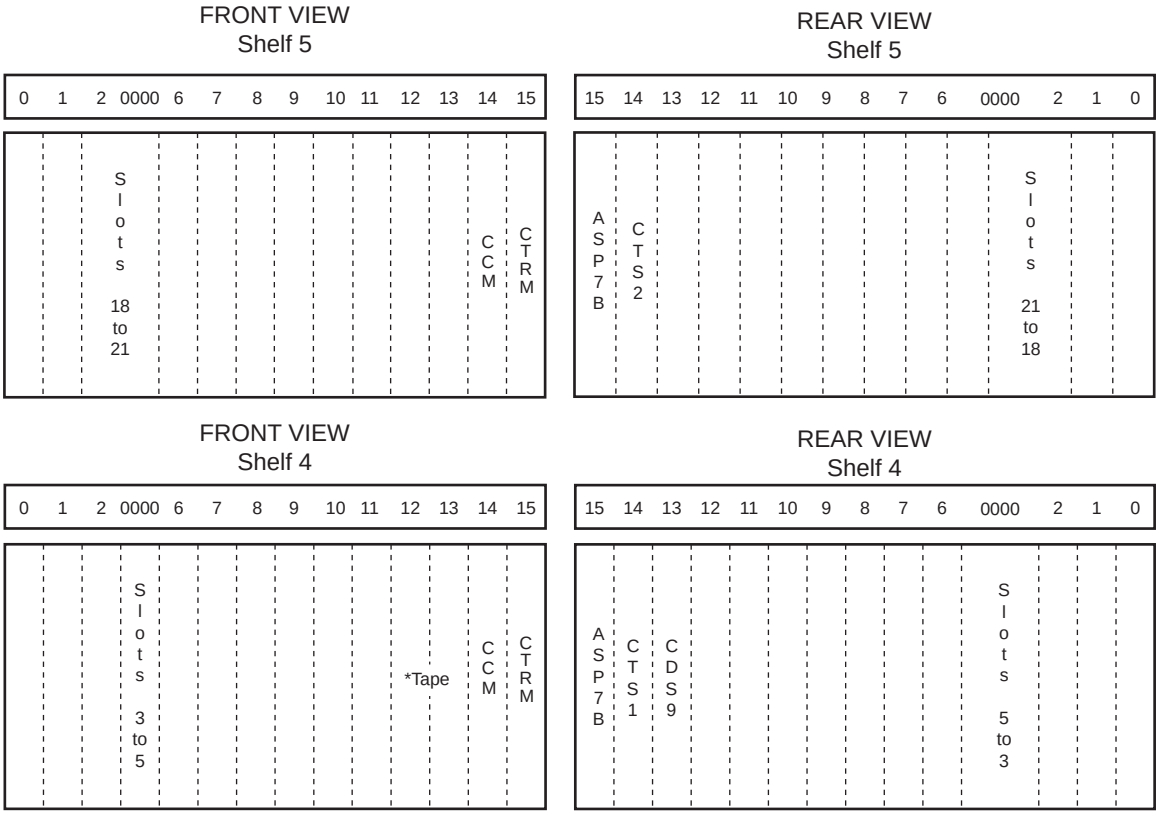

* Tape can be external or in any slot, depending on cable length.

**FIGURE 7-2. BNS-2000 Single CCM System With MRCIO**




* Tape can be external or in any slot.

**FIGURE 7-3. BNS-2000 Dual CCM System With MRCIO (CCMs in Same Shelf)**




* Tape can be external or in any slot.

**FIGURE 7-4. BNS-2000 Dual CCM System With MRCIO**

### PROCEDURE 7-16. BNS-2000 ECPU System to Release 5.0 ECPU System

**Application:** To upgrade a Release 1.2 or 2.0 ECPU system to a Release 5.0 ECPU system. A Release 3.0 or Release 4.0 ECPU system does not need a hardware upgrade.

**Requirements:** Preserve the existing database before starting the upgrade; see the procedure for Preserving the Database.

This procedure should be followed by the procedure for Upgrading a BNS-2000 Software Release: Single Control Computer or the procedure for Upgrading a BNS-2000 Software Release: Dual Control Computer.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules or I/O boards.

1. Enter the following command sequence to stop the Control Computer.

```
CC0> stop
.  .  .
LOADER> monitor
.  .  .
MONITOR>
```

2. *For a dual Control Computer system only:* enter the following command sequence to stop the standby Control Computer.

```
MONITOR>  Escape  Escape
MRC> connect standby
SC1> stop
.  .  .
LOADER> monitor
.  .  .
MONITOR>
```

2. Power down the node.

**PROCEDURE 7-16. BNS-2000 ECPU System to Release 5.0 ECPU System** (continued)

3. Remove the Control Computer module indicated in the following table.

| ECPU System to BNS-2000 Release 5.0 ECPU System Modular Cabinet—Modules and I/O Boards Removed | | | |
|---|---|---|---|
| Logical Slot Number | | Type | Module |
| Shelf 4 | Shelf 5 | | |
| 75 | 91 | Disk | TN2175 |

4. Insert the new module as indicated in the following table.

   Before installing the disk drives, remove the three terminating resistors from the disk drive, and save them. See the following table.

| ECPU System to BNS-2000 Release 5.0 ECPU System Modular Cabinet—Modules and I/O Boards Installed | | | |
|---|---|---|---|
| Logical Slot Number | | Type | Module |
| Shelf 4 | Shelf 5 | | |
| 75 | 91 | Disk | TN2175B |

5. Verify that the new modules are in the correct slots for a modular cabinet; see the appropriate figures in this chapter.

   **NOTE:** If you need to format the new disk drive, see the appropriate procedure in the **Node Operations** chapter. A hard disk should be formatted or reformatted *only* on the active Control Computer.

6. Go to the procedure for Verifying the Control Computer and Disk Hardware Hardware Installation.

   After verifying the installation, continue with Step 5A, Upgrading the BNS-2000 Software to a New Release, and choose the appropriate procedure for your system.

When inserting the new disk drive(s), check the following figures to make sure they are in the correct slot for your system.

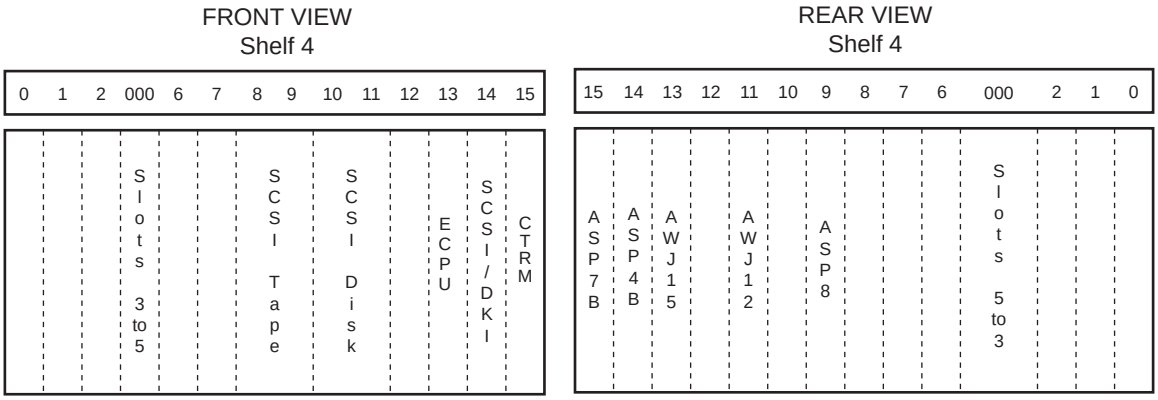



**FIGURE 7-5. BNS-2000 Single Control Computer and Single Disk/Tape Slot Assignments (ECPU)**

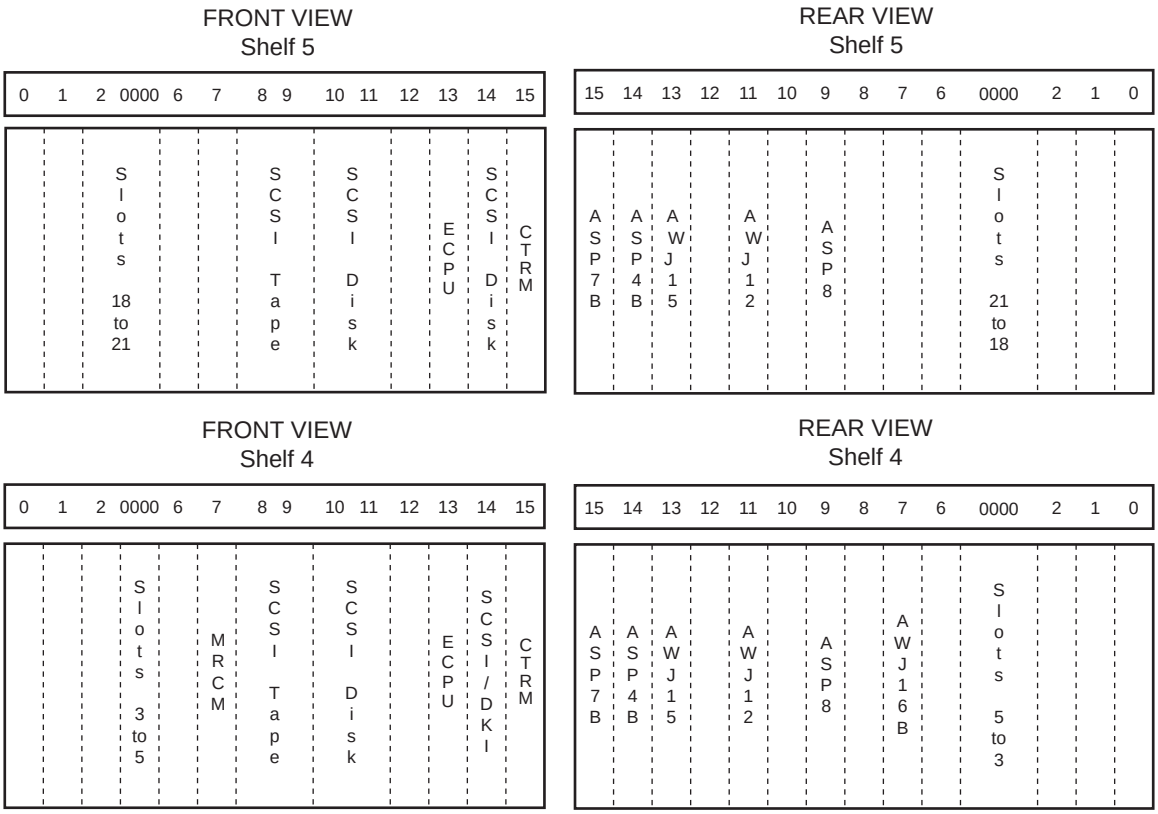



**FIGURE 7-6. BNS-2000 Dual Control Computers and Dual Disks/Tapes With MRCM Slot Assignments (ECPU)**

### PROCEDURE 7-17. Verifying the Control Computer and Disk Hardware Installation

1. Verify that the controller mode switch (on the CCM or SCSI/DKI faceplate) is in the DIAG position.
2. Power up the node.
3. Verify that the console is in monitor mode. If the **MONITOR>** prompt is not displayed, check the console connection and hardware installation.
4. Run Control Computer firmware diagnostics.
   a. *For a CCM system:*
      – with a single CCM, execute the command **di e5dd**
      – with a dual CCM, execute the command **di f5dd**
   b. *For an ECPU system:*
      – if the node does *not* have a secondary disk and tape, execute the command **di c7cf**
      – if the node has a secondary disk/tape, execute the command **di f7cf**

      **NOTE:** These diagnostic commands will take 4 to 6 minutes to complete. On a CCM system with a dual Control Computer, the primary tape test will fail, which is normal.

5. Verify that all diagnostics have **PASSED** .

   If the diagnostics fail, go to the appropriate procedures in the **Node Troubleshooting** chapter to run Monitor Mode Diagnostics to rerun specific diagnostics and to recover from Monitor Mode Diagnostic Failure to resolve problems.
6. Continue with the next step to upgrade the software.

### PROCEDURE 7-18. General Procedure for Upgrading BNS-2000 Switch Complex Hardware

**Application:** These steps apply to the following procedure for upgrading BNS-2000 Series M2 Switch Complexes from the standard switch complex to the extended switch complex.

See **Node Installation** for more information on handling hardware, setting switches on modules, and cabling the Control Computer configurations.

**NOTE:** The following steps are not executed here, but within the procedure that follows.

- Upgrade the node to BNS-2000 Release 5.0 software.
- Power down the node.
- Remove the existing switch complex module boards.
- Remove the existing cables from the switch complex I/O boards.
- Remove the existing switch complex I/O boards.
- Remove the existing Series M2 Extension Shelf I/O board(s).
- Insert the new switch complex I/O board.
- Insert the new Series M2 Extension Shelf I/O board(s).
- Connect the cables on the new control complex I/O board.
- Install the new Series M2 Extension Shelf cables.
- Insert the new switch complex module boards.
- Power up the node.
- Run diagnostics on the new switch complex components.

**NOTE:** Save the old (existing) modules, I/O boards, and cables that are removed from the node. They will be returned to the factory or they will be used to backout of the node upgrade, if necessary.

### PROCEDURE 7-19. Upgrading a BNS-2000 Standard Switch Complex to an Extended Switch Complex System

**Application:** A BNS-2000 node with BNS-2000 Release 5.0 software.

**Switches:** CC0: DIAG; CC1: DIAG.

1. Synchronize and back up the database using the **sync** and **backup** commands.
2. *If using the MRC,* set automatic recovery off using the **set recovery off** MRC mode command first, and then return to the active Control Computer prompt using the MRC attention signal. (The following examples show **`CC0>`** as the active Control Computer prompt.)

```
CC0>  Escape  Escape
MRC> set recovery off
MRC>  Escape  Escape
CC0>
```

3. Type the following command sequence to access monitor mode.

```
CC0> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

4. *For dual Control Computers,* enter the following commands at the **`MONITOR>`** prompt.

```
MONITOR>  Escape  Escape
MRC> connect standby
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

**PROCEDURE 7-19. Upgrading a BNS-2000 Standard Switch Complex to an Extended Switch Complex System** (continued)

5. Follow the instructions for your configuration.

   ***A. Powering Down a Node without a Base Power Unit:***

   Turn *off* the main power switch on the AC power entry module at the back of each cabinet.

   ***B. Powering Down a Node with a Base Power Unit:***

   Switch *off* the circuit breaker associated with each cabinet/shelf on the rear of the Base Power Unit.

   ***C. Powering Down Shelves in a CO Frame:***

   Switch *off* the power from the power distribution panel that feeds into the terminal block at the top of the CO frame or remove the fuses for the shelf at the top of each bay.

6. Remove the existing switch complex module boards from the front of the Series M2 Switch Shelf. Remove the cables and the I/O boards from the back of the shelf as indicated in the following table. (Set these components aside so they can be returned to the factory or be used to backout from the upgrade.)

**TABLE 7-8. BNS-2000 Standard Switch Complex with Modules and I/O Boards Removed**

| Shelf | Slot | Module | I/O Board |
|---|---|---|---|
| Series M2 Switch Shelf | A | CMA1 | CNA1 |
| | B | CMA1 | CMC3 |
| Series M2 Extension Shelf | 0 | — | CNA2 |

If the battery backup unit (BBU) alarm cable is used, disconnect it; but, do not remove it. (It will be reconnected to the new I/O board.)

7. Insert the new switch complex I/O boards and modules as indicated in the following table and steps. When installing the CUW1 boards, set the DIP switch for 75 or 120 ohm E1 operation, as required.

   **Installation Tip:** To install a CNA7, use a flashlight to illuminate the bottom guides. Start by easing the bottom guides into place; then, fit the top guides into place.

**TABLE 7-9. BNS-2000 Extended Switch Complex with Modules and I/O Boards Installed**

| Shelf | Slot | Module | I/O Board |
|---|---|---|---|
| Series M2 Switch Shelf | A | CTG13 | CNA7 |
| | B | CTG13 | CUW1 A and B |
| Series M2 Extension Shelf | 0 | — | CNA8 |

8. Install the new cables from the CNA7 in the rear of the Series M2 Switch Shelf to each Series M2 Extension Shelf. The number for each Series M2 Extension Shelf is determined by the jack position on the CNA7. (Jacks J3 through J7 connect to the Series M2 Extension Shelf as shown in Figure 2-20.) When installing the cable to the CNA7, align the left side of the plug with the left side of the jack. See the following figure.

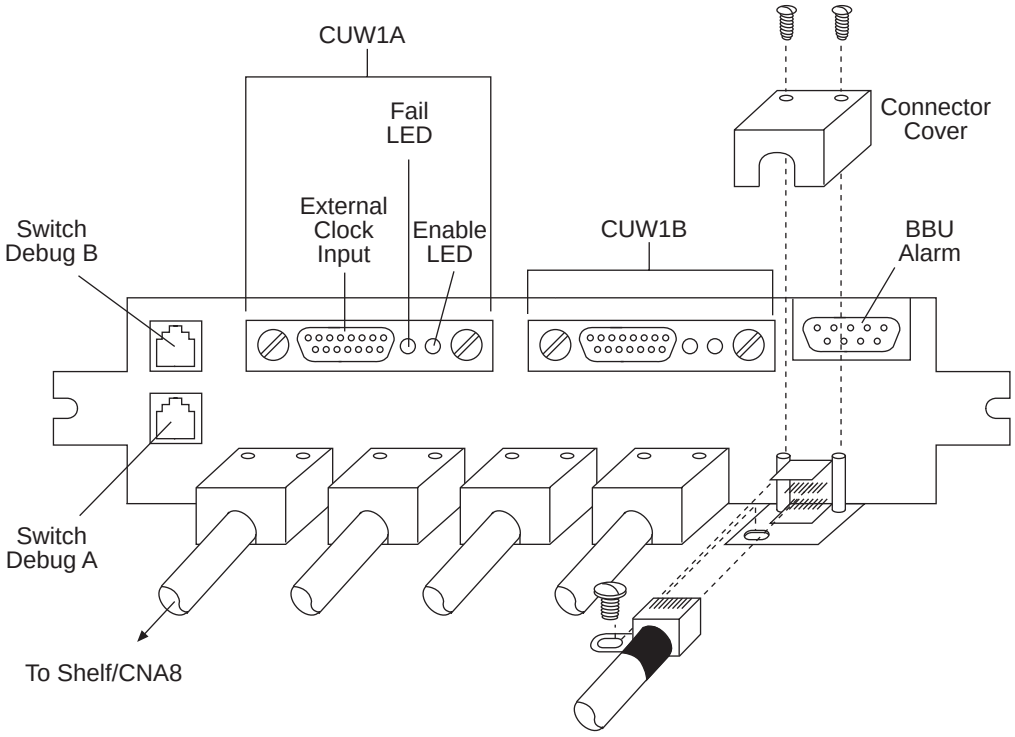



**FIGURE 7-7. Back View of the CNA7 I/O Board**

9. Secure the ground lugs on the cables to the bottom of the covers using the one #10 screw supplied. Then, fasten the connector covers to the connector bottom using the two #4 screws supplied.

10. If external timing is to be used to synchronize the Stratum 4 Clock, make the connections to the CUW1 modules A and B as required.

    The CUW1 RIB board has a switch that requires configuration. When using an E1 external clock reference signal, the switch does not have any effect for T1 and 64kcc external signals. Refer to the following table for CUW1 switch settings.

| Clock Reference | 75 Ohm | 120 Ohm |
|---|---|---|
| T1 | N/A | N/A |
| E1 | Away from CUW1 Faceplate | Toward the CUW1 Faceplate |
| 64 kcc | N/A | N/A |

    In addition, cabling for external clock signals must be terminated as shown in the following table. The pin connection shown are for terminating Central Office (CO) clock signals.

    A wire wrap connector is provided if this type of connection is required. It is inserted into the DB-15 external input connector on the CUW1s and is screwed in place. Wire wrap connections are then made to the wire wrap pins as shown in the table.

| Clock Reference | Tip | Ring | Shield |
|---|---|---|---|
| T1 | Pin 3 | Pin 11 | — |
| E1 | Pin 5 | Pin 13 | Pin 14 |
| 64 kcc | Pin 8 | Pin 15 | — |

11. Reconnect the BBU alarm cable to the right of the CNA 7, if used.
12. Verify the new modules and I/O boards are installed in the correct slots for the system; see the previous table.

13. Follow the instructions for your configuration.

### *A. Powering Up a Node Without a Base Power Unit*

Application: One- or two-cabinet system without a Base Power Unit.

1. For AC modular cabinets containing 611A power supplies, check that the voltage range selection on each off-line switcher (OLS) power supply is set correctly (HIGH or LOW) for the input voltage of each modular cabinet. The switch positions are marked on the label and clearly visible when you pull out the cabinet power supply:

   208/240 VAC/350 VDC = HIGH
   120 VAC = LOW

2. For a two-cabinet system that does not have a Base Power Unit, check that both 120 VAC line cords are plugged into a 20 A (or greater) branch circuit.

   The administration console is not powered from the cabinet and requires a separate outlet.

3. Set the controller mode switch on the faceplate of the CCM or SCSI/DKI (UN635B) module:

   - *For a single Control Computer configuration:* set the controller mode switch to DIAG.
   - *For a dual Control Computer configuration:* on CC0, set the controller mode switch to DIAG; on CC1, set the controller mode switch to DISAB.

4. At the back of each modular cabinet, verify that one end of the AC line cord for 120 VAC (USA voltage) is plugged into the appliance receptacle on the back of the cabinet and that the other end of the cord is plugged into the branch circuit.

5. Turn on the main power switch on the AC power entry module at the back of the modular cabinet.

6. To verify that the system has power, check the front of each modular cabinet to ensure that the LEDs on the power supplies are green, and that the fans are operating.

### *B. Powering Up a Node With a Base Power*

Application: One- or two-stack node with a Base Power Unit.

Switches: CC0: DIAG; CC1: DISAB.

1. At the back of each cabinet/shelf, verify that one end of the AC line cord is connected to the Base Power Unit and the other end is connected to the AC power entry module in the shelf.
2. Verify that the line cord running from the rear of the Base Power Unit to the wall socket is plugged in and the branch circuit is on.
3. For each shelf, switch on the appropriate circuit breaker(s) on the back of the Base Power Unit: the breakers are labeled: Cabinet 0 or 4 through Cabinet 3 or 7.
4. Repeat steps 1 through 3 for the second stack.
5. At the front of each cabinet/shelf, verify that the green LEDs on the power supplies are lit and that the fans are operating.
6. After the node has been powered up, check the Control Computer cabling.
7. Use monitor mode diagnostics to verify the connections on the CCMs or on the ECPU and the SCSI/DKI modules; see the **Node Troubleshooting** chapter.

### C. Powering Up a CO Frame

Application: CO frame.

Switches: CC0: DIAG; CC1: DISAB.

1. For BNS-2000 nodes, switch on power from the power distribution panel that feeds into the terminal block at the top of the CO frame.
2. Verify that the fuses are in the top bay for each shelf. The switches are numbered 0 through 3 for the first stack of cabinets, and 4 through 7 for the second stack of cabinets.
3. At the front of each shelf, verify that the green LEDs on the power supplies are lit and that the fans are operating.
4. After the node has been powered up, check the Control Computer cabling.
5. Use monitor mode diagnostics to verify the connections on the CCMs or on the ECPU and the SCSI/DKI modules; see the **Node Troubleshooting** chapter.

14. Boot the node to the LOADER mode by typing **boot** at the MONITOR prompt and then run **diagnose switch** and **diagnose str4**. (Refer to *Data Networking Products Commands Reference*.)
15. After you have installed and run diagnostics on the new components, apply the address and slot labels that are supplied with the new equipment.

*The hardware installation for an Extended Switch system is now completed.*

## Step 4B. Upgrading *Datakit* II VCS Hardware

This section outlines the general steps and then gives specific procedures for directly upgrading a node cabinet/shelf, or a Model 2000 cabinet, to the new release.

**NOTE:** Upgrading a Model 500 cabinet to *Datakit* II VCS Release 6.0 is *not* supported; and upgrading a Model 2000 node to a CCM system is not supported.

The following node hardware configurations can be converted for Release 6.0:

- CPU system to CCM system
- CPU system to ECPU system (TN2175B disk)
- ECPU system to CCM system
- ECPU system (old disk) to ECPU system (TN2175B disk)

Control Computer modules, associated I/O boards, and cables must be replaced by *Datakit* II VCS Release 6.0 components.

The following table compares the modules used in previous systems to those required for the new release.

**TABLE 7-10. *Datakit* II VCS Control Computer Hardware**

| Modules and I/O Boards in *Datakit* II VCS Node Cabinet/Shelf or Model 2000* | | | |
|---|---|---|---|
| **CPU System** | **Pre-Release 6.0 ECPU System*** | **Release 6.0 ECPU System*** | **Release 6.0 CCM System** |
| CPU (MC1D084)<br>AWJ15 | ECPU (MC1D138A1)<br>AWJ15 | ECPU (MC1D138A1)<br>AWJ15 | CCM (TN2235)<br>CTS2† |
| RAM8 (UN326)<br>ED5P080-30,G1 | —<br>— | —<br>— | —<br>— |
| SCSI/DKI (UN635/UN635B)<br>ASP4 | SCSI/DKI (UN635B)<br>ASP4 | SCSI/DKI (UN635B)<br>ASP4B | —<br>— |
| Disk (TN2098/<br>TN2175)<br>AWJ12 | Disk (TN2098/<br>TN2175/TN2175B)<br>AWJ12 | Disk (TN2175B)<br>AWJ12 | on CCM<br>— |

| Modules and I/O Boards in *Datakit* II VCS Node Cabinet/Shelf or Model 2000* | | | |
|---|---|---|---|
| **CPU System** | **Pre-Release 6.0 ECPU System*** | **Release 6.0 ECPU System*** | **Release 6.0 CCM System** |
| Tape (TN2097) AWJ12/ASP8** | Tape (TN2097) AWJ12/ASP8** | Tape (TN2097) ASP8** | DDS Tape (TN2233) CSD9 |
| | | | DDS Tape (external)†† (ED3P325-30,G407) |
| M-bus cable (843243833) | M-bus cable (843243833) | M-bus cable (843243833) | ABM cable (MRC) AB cable (no MRC) |
| MRCM (TN2109/ TN2109B/TN2109C) AWJ16/AWJ16B | MRCM (TN2109/ TN2109B/TN2109C) AWJ16/AWJ16B | MRCM (TN2109C) AWJ16B | MRCIO CTS1 |
| SCSI-Local cable | SCSI-Local cable | SCSI-Local cable | 2 x SCSI cables (MRC) |
| SCSI-Short cable | SCSI-Short cable | SCSI-Short cable | A1B1C1 cable (MRC) |
| SCSI-Remote cable | SCSI-Remote cable | SCSI-Remote cable | power cable (MRC) |

* Model 2000 can be upgraded to ECPU Release 6.0 only.
** Model 2000 uses AWJ12 only; modular cabinet/shelf uses AWJ12 or ASP8 I/O board.
† This I/O board provides no MRC functionality.
†† To retrieve the old database, you must have an AWJ12 or a new CSD9 I/O board.

See the *System Description* for a complete description of hardware components.

### PROCEDURE 7-20. General Procedure for Upgrading *Datakit* II VCS Hardware

**Application:** These steps apply to all procedures in this chapter for upgrading *Datakit* II VCS node hardware.

See the Node Module and I/O Board Installation section in **Node Installation** for more information on handling hardware, setting switches on modules, and cabling the Control Computer configurations.

1. Remove the control complex modules.
2. Remove the cables from the control complex I/O boards.
3. Remove the control complex I/O boards.
4. Insert the new control complex I/O boards.
5. Connect the cables on the new control complex I/O boards.
6. Insert the new control complex modules.
7. Power up the control complex cabinet.
8. Run firmware diagnostics on the new Control Computer components.

Choose the procedure that is appropriate for your equipment, and begin the hardware upgrade:

- Modular Cabinet Hardware: CPU System to Release 6.0 CCM System
- Modular Cabinet Hardware: CPU System to Release 6.0 ECPU System
- Model 2000 Hardware: CPU System to Release 6.0 ECPU System
- Modular Cabinet Hardware: ECPU System to Release 6.0 CCM System

  **NOTE:** For BNS-1000 upgrades, follow the instructions in this procedure.

- Modular Cabinet Hardware: ECPU System to Release 6.0 ECPU System
- Model 2000 Hardware: ECPU System to Release 6.0 ECPU system

### PROCEDURE 7-21. Modular Cabinet Hardware: CPU System to *Datakit* II VCS Release 6.0 CCM System

**Application:** To upgrade a *Datakit* II VCS CPU system to a CCM system.

**Requirements:** Preserve the existing database before starting the upgrade; see the appropriate procedure provided in this chapter.

**Switches:** CC0: DIAG.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules or I/O boards.

1. *For a dual CPU system:* Disable automatic recovery and backup; see the appropriate procedure provided in this chapter.
2. Enter the following command sequence to bring down the Control Computer.

```
CC0>
Timeout On Input
CC0> stop

*** Trying To Boot From Primary Disk ***

A RECOVERY REBOOT
 Reason: SOFTWARE INITIATED BY ADMINISTRATOR

TYPE ? for help
LOADER> monitor

*** DKC Loader Monitor 3.0.1 ***
. . .
MONITOR>
```

3. Remove the Control Computer modules from the front of the shelf and the I/O boards from the back of the shelf, as indicated in the following table.

**PROCEDURE 7-21. Modular Cabinet Hardware: CPU System to *Datakit* II VCS Release 6.0 CCM System** (continued)

| CPU System to *Datakit* II VCS Release 6.0 CCM System Modular Cabinet—Modules and I/O Boards Removed | | | | |
|---|---|---|---|---|
| Slot Number | | Type | Module | I/O Board |
| Shelf 0 | Shelf 1 | | | |
| 1 | — | Switch | TN1002B | — |
| 12 | 28 | RAM8 | UN326 | ED5P080-30,G1 |
| 13 | 29 | CPU | MC1D084 | AWJ15 |
| 14 | 30 | SCSI/DKI | UN635 | ASP4 |
| 11 | 27 | Disk | TN2175 | AWJ12 |
| | — | Tape | TN2097 | AWJ12/ASP8 |

**NOTE:** Keep the old 40MB tape drive at hand because you will use it later to retrieve the database.

If you have an external tape drive, leave the AWJ12 I/O board in the node until later to use when retrieving the database.

Check to make sure that the 40MB tape drive has the terminating resistors installed.

All the other modules and I/O boards can be packaged for recycling.

4. Insert the new modules and I/O boards, as indicated in the following table.

**PROCEDURE 7-21. Modular Cabinet Hardware: CPU System to *Datakit* II VCS Release 6.0 CCM System** (continued)

| CPU System to *Datakit* II VCS Release 6.0 CCM System Modular Cabinet—Modules and I/O Boards Installed | | | | |
|---|---|---|---|---|
| **Slot Number** | | **Type** | **Module** | **I/O Board** |
| **Shelf 0** | **Shelf 1** | | | |
| 1, 2* | — | Eswitch | TN2099 | — |
| 11-12 | — | Tape (internal)** | TN2233 | CSD9 |
| — | — | Tape (external) | ED3P325-30,G407 | |
| 13† | 29† | CCM | TN2235 | CTS1 (MRCIO)††<br>CTS2 (no MRC) |
| 14† | 30† | CCM | TN2235 | CTS1 (MRCIO)††<br>CTS2 (no MRC) |

* Optional redundant Eswitch.
** The internal tape drive can go in any two slots, depending on the cable length.
† Any *magic* slot in the node may be used for the controller: for example, 13, 14, 29, 30, 45, 46.
†† A dual CCM configuration uses both CTS1 and CTS2; a single CCM configuration, uses one or the other.

5. Insert a CSD9 I/O board in the slot behind where the tape drive will reside (if an internal tape drive is being used); for example, in slot 12.
6. Insert the new tape drive in its designated slot in front of the CSD9.

   The tape drive overlaps one additional slot; for example, slot 11, if the module is placed in slot 12.
7. *For a single CCM system:* Insert either the CTS1 (MRCIO) or CTS2 (no MRC) I/O board for the new CCM behind slot 13 or 14.

   *For a dual CCM configuration:*

   For two CCMs in the same cabinet, use slots 13 and 14.

   For example: In a node with empty slots and no I/O boards in slots 13 and 14, insert a CTS1 (MRCIO) into the back of slot 13, and a CTS2 (controller I/O board) in the back of slot 14.

   For two CCMs in adjacent cabinets, use slots 14 and 30.

   Cable the two I/O boards together, starting with the bottom SCSI port of the CTS1 and working up to the top, as follows:

   a. Connect SCSI 1 of CTS1 to SCSI 0 of CTS2.
   b. Connect the A1B1C1 port of CTS1 to A1B1C1 port of CTS2.
   c. Connect the power port of CTS1 to power port of CTS2.
   d. Connect the ABM cable of CTS1.

e. Connect the SCSI 0 of CTS1 to SCSI 1 of CTS2.

f. Connect the console to the A port of the ABM cable.

8. *For a single CCM system:*

   a. With the CCM controller mode switch in the DISAB position, insert the module into the selected slot; wait approximately 5 seconds for the disk drive to spin up, and set the controller mode switch to the DIAG position.

   b. Connect the AB cable to ports A and B.

   c. Check that port A displays the **`MONITOR>`** prompt.

   *For a dual CCM system:*

   a. With the CCM controller mode switch in the DISAB position, insert the first CCM (0) into the selected slot; wait approximately 5 seconds for the disk drive to spin up, and set the controller mode switch to the DIAG position.

   b. With the CCM controller mode switch in the DISAB, insert the second CCM (1); wait approximately 5 seconds for the disk drive to spin up, and set the controller mode switch to the DIAG position

   c. Check that port M displays the **`MRC>`** prompt and that port A displays the **`MONITOR>`** prompt.

9. To cable the tape drive:

   *For a single CCM system:* Cable the tape drive to SCSI bus 1 (the bottom connector on CTS1 or CTS2 I/O board).

   *For a dual CCM system:* Cable the tape drive to SCSI bus 1 (the bottom connector on CTS1 I/O board) in slot 13. (The connector is stackable).

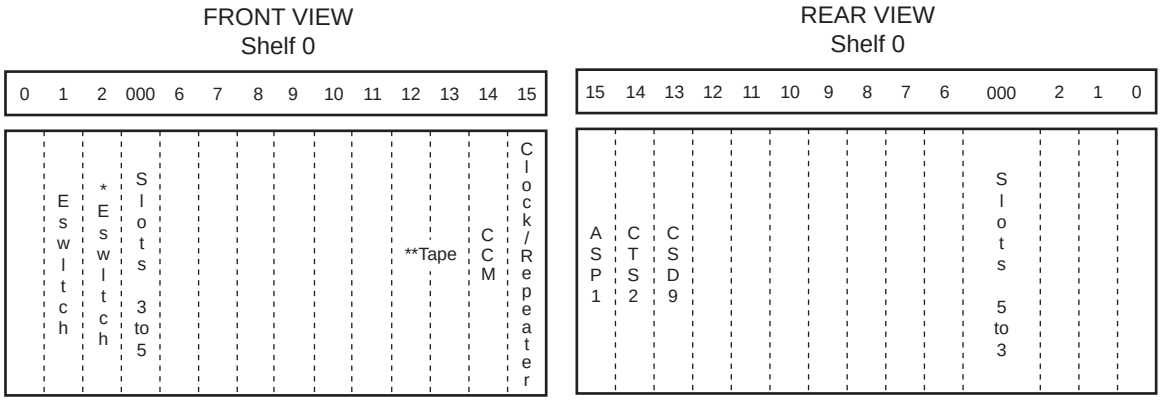
10. Verify that the new modules are in the correct slots for your configuration; see the appropriate figures provided in this chapter.

11. When you have finished installing the new components, apply the address and slot labels supplied with the new equipment.

    *This completes the hardware installation for a CCM system.*

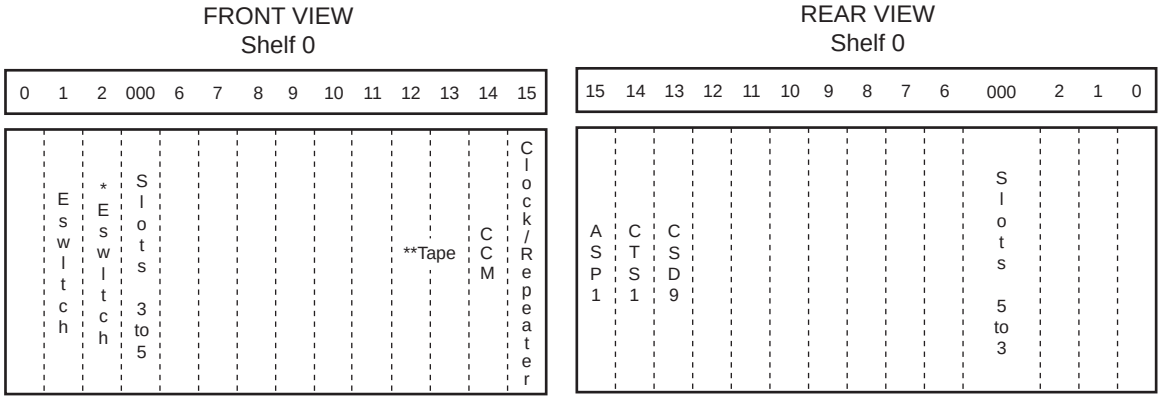
12. Go to the procedure for Verifying the Hardware Installation.

    After verifying the installation, continue with Step 5B, Upgrading the *Datakit* II VCS Software to a New Release, and choose the appropriate procedure for your configuration.



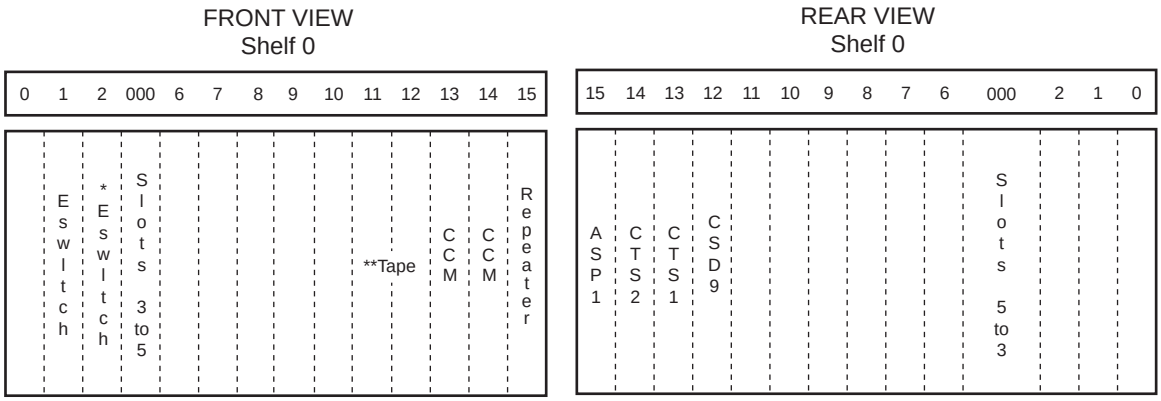

* Optional redundant Eswitch
** Tape can be external or in any slot, depending on cable length.

**FIGURE 7-8. Modular Cabinet Slot Assignments: *Datakit* II VCS Release 6.0 Single CCM System Without MRCIO**



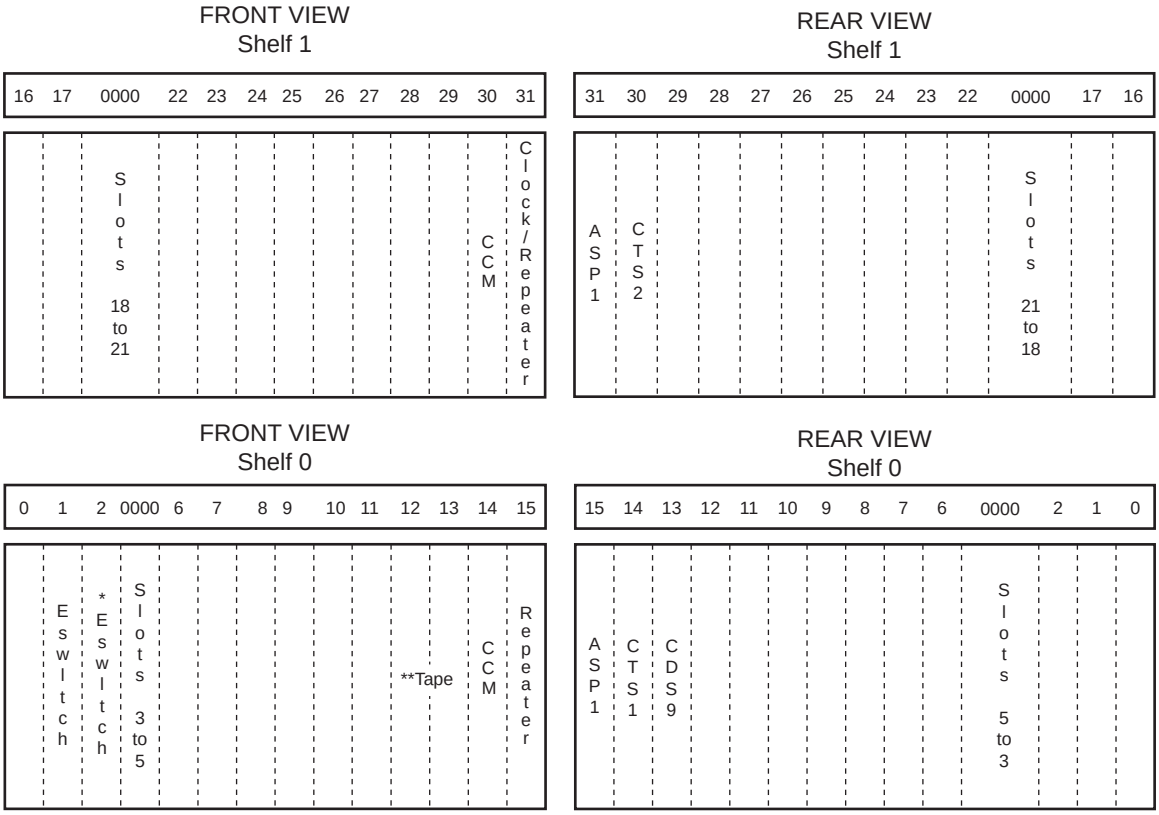

* Optional redundant Eswitch
** Tape can be external or in any slot, depending on cable length.

**FIGURE 7-9. Modular Cabinet Slot Assignments: *Datakit* II VCS Release 6.0 Single CCM System With MRCIO**




* Optional redundant Eswitch
* * Tape can be external or in any slot.

**FIGURE 7-10. Modular Cabinet Slot Assignments: *Datakit* II VCS Release 6.0 Dual CCM System With MRCIO (CCMs in Same Shelf)**




* Optional redundant Eswitch
* * Tape can be external or in any slot.

**FIGURE 7-11. Modular Cabinet Slot Assignments: *Datakit* II VCS Release 6.0 Dual CCM System With MRCIO**

### PROCEDURE 7-22. Modular Cabinet Hardware: CPU System to *Datakit* II VCS Release 6.0 ECPU System

**Application:** To upgrade the CPU system in a modular cabinet to an ECPU system running the new release.

**Requirements:** Preserve the existing database before starting the upgrade; see the appropriate procedure provided in this chapter.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules or I/O boards.

1. Enter the following command sequence to bring down the Control Computer.

```
CC0> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

2. *For a dual Control Computer system using MRC:* enter the following command sequence to stop the standby Control Computer.

```
MONITOR> Escape Escape
MRCM> connect standby
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

3. Set the CPU controller mode switch to DISAB, and remove the Control Computer modules from the front of the shelf as indicated in the following table.

   **NOTE:** If the SCSI/DKI board in the node is a UN635B, it need not be removed and replaced.

**PROCEDURE 7-22. Modular Cabinet Hardware: CPU System to *Datakit* II VCS Release 6.0 ECPU System** (continued)

| CPU System to *Datakit* II VCS Release 6.0 ECPU System Modular Cabinet—Modules and I/O Boards Removed | | | | |
|---|---|---|---|---|
| Slot Number | | Type | Module | I/O Board |
| Shelf 0 | Shelf 1 | | | |
| 1 | — | Switch | TN1002B | — |
| 12 | 28 | RAM8 | UN326 | ED5P080-30,G1 |
| 13 | 29 | CPU | MC1D084 | |
| 14 | 30 | SCSI/DKI | UN635 | ASP4 |
| 11 | 27 | Disk | TN2175 | |

4. Remove the right and middle connectors on the M-bus cable (a plastic ribbon cable at the back of the Control Computer I/O boards). Unlatch the top and bottom small white fasteners from each connector before removing them.
5. Remove the Control Computer I/O boards as indicated in the previous table.
6. Re-attach the M-bus cable. Only the two end connectors of this cable (shelf 0, slots 13 and 14, and shelf 1, slots 29 and 30) are reused.

   Wedge the spare, middle connector into the space between the boards to get it out of the way.
7. Insert the new modules and I/O boards, as indicated in the following table.

   Before installing the disk drives, remove the three terminating resistors (labeled Z1, Z2, and Z3) from the disk drive, and save them; see the following figure.

**PROCEDURE 7-22. Modular Cabinet Hardware: CPU System to *Datakit* II VCS Release 6.0 ECPU System** (continued)

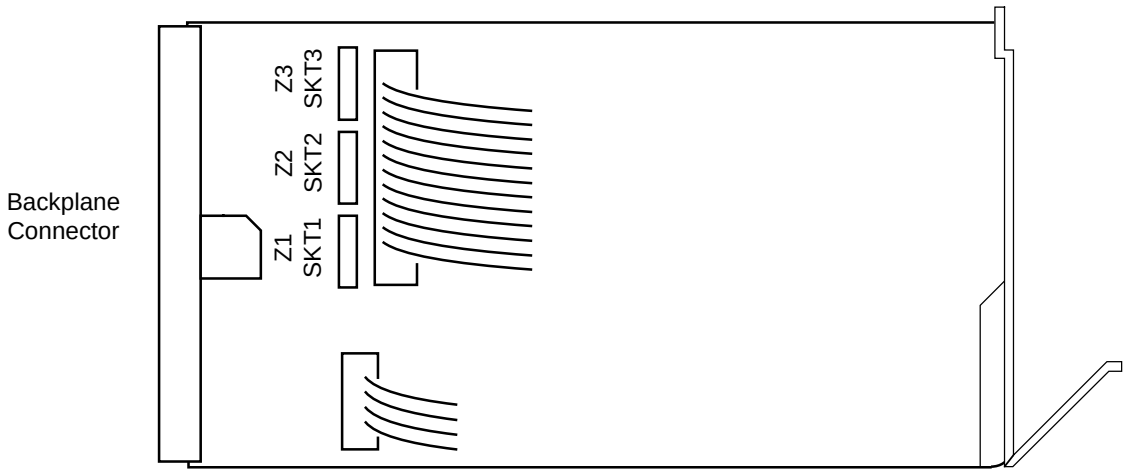


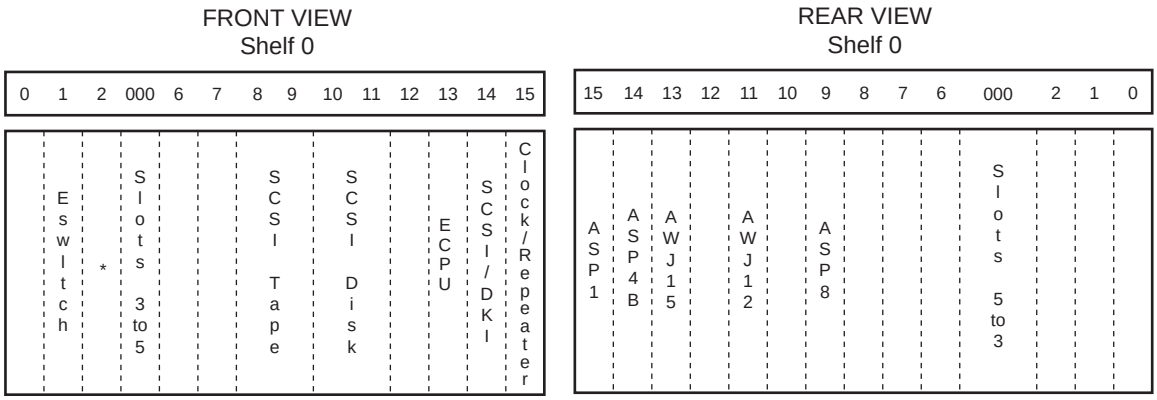

**FIGURE 7-12. Terminating Resistors on *Datakit* II VCS ECPU System Disk Drive**

| CPU System to *Datakit* II VCS Release 6.0 ECPU System Modular Cabinet—Modules and I/O Boards Installed | | | | |
|---|---|---|---|---|
| Slot Number | | Type | Module | I/O Board |
| Shelf 0 | Shelf 1 | | | |
| 1, 2* | — | Eswitch | TN2099 | — |
| 11 | 27 | Disk | TN2175B | |
| 13 | 29 | ECPU | MC1D138A1 | |
| 14 | 30 | SCSI/DKI | UN635B | ASP4B |
| * Optional redundant Eswitch | | | | |

Check that the switch on the faceplate of the Eswitch (TN2099) module is set to ENABL and that the controller mode switch on the faceplate of the SCSI/DKI is set to DIAG.

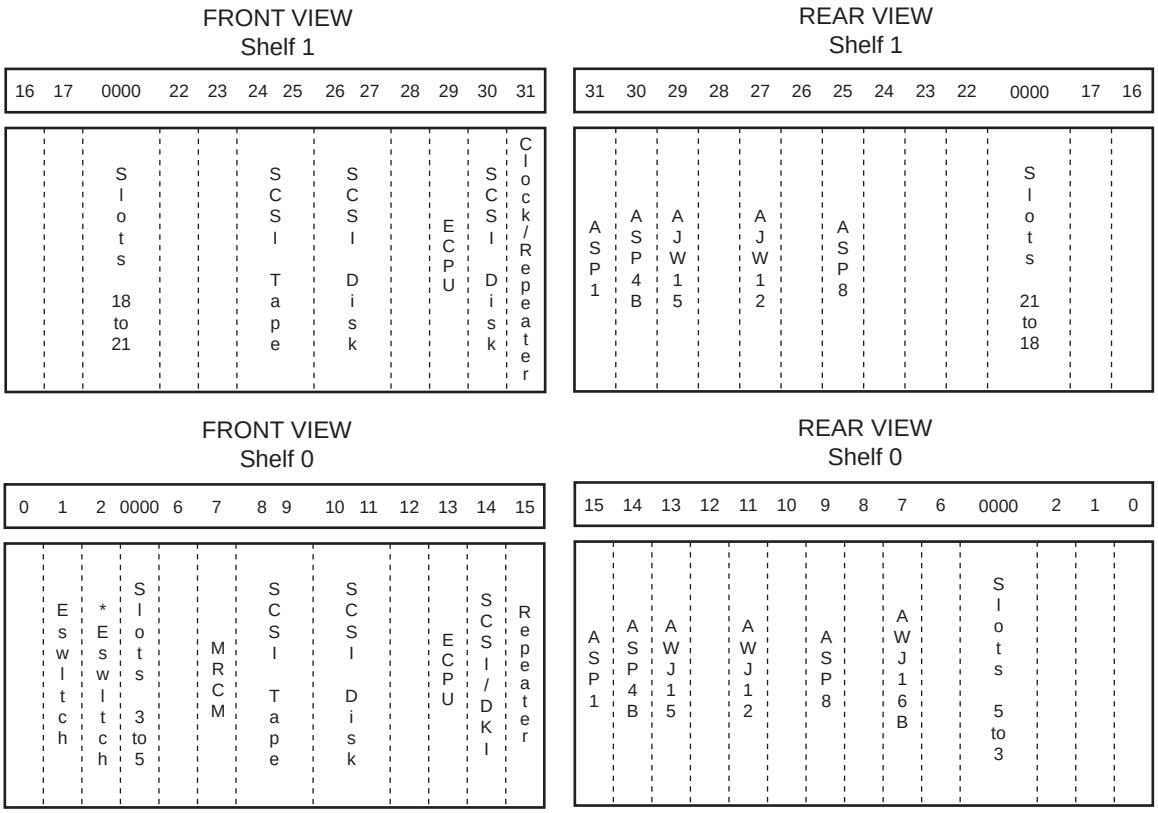
7. Verify that the modules and I/O boards are in the correct slots; see the appropriate figures provided in this chapter.
8. Go to the procedure for Verifying the Hardware Installation.

   After verifying the installation, continue with Step 5B, Upgrading the *Datakit* II VCS Software to a New Release, and choose the appropriate procedure for your configuration.




* Optional redundant Eswitch

**FIGURE 7-13. Modular Cabinet Slot Assignments: *Datakit* II VCS Release 6.0 ECPU System Single Control Computer**




* Optional redundant Eswitch

**FIGURE 7-14. Modular Cabinet Slot Assignments: *Datakit* II VCS Release 6.0 ECPU System Dual Control Computers**

### PROCEDURE 7-23. Model 2000 Hardware: CPU System to *Datakit* II VCS Release 6.0 ECPU System

**Application:** To upgrade the CPU system in a Model 2000 cabinet to a *Datakit* II VCS Release 6.0 ECPU system.

**Requirements:** Preserve the existing database before starting the upgrade; see the appropriate procedure provided in this chapter.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules and I/O boards.

1. Enter the following command sequence to stop the Control Computer.

```
CC0> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

2. *For a dual Control Computer system only;* enter the following command sequence to stop the standby Control Computer.

```
MONITOR> Escape Escape
MRC> connect standby
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

3. Remove the Control Computer modules indicated in the following table.

   **NOTE:** If the SCSI/DKI board in the node is a UN635B, it need not be removed.

**PROCEDURE 7-23. Model 2000 Hardware: CPU System to *Datakit* II VCS Release 6.0 ECPU System** (continued)

| CPU System to *Datakit* II VCS Release 6.0 ECPU System Model 2000—Modules and I/O Boards Removed | | | | |
|---|---|---|---|---|
| Slot Number | | Type | Module | I/O Board |
| Shelf 0 | Shelf 1 | | | |
| 1 | — | Switch | TN1002B | — |
| S01 | S01 | Disk | TN2098 or TN2175 | |
| S02 | S06 | CPU | MC1D084 | |
| S03 | S07 | RAM8 | UN326 | ED5P080-30,G1 |
| 14 | 30 | SCSI/DKI | UN635 | ASP4 |

4. Remove the right and middle connectors on the M-bus cable (a plastic ribbon cable at the back of the Control Computer I/O boards). Unlatch the top and bottom small white fasteners on each connector before removing them.
5. Remove the Control Computer I/O boards as indicated in the previous table.
6. Re-attach the M-bus cable. Only the two end connectors of this cable (shelf 0, slots 13 and 14, and shelf 1, slots 29 and 30) are reused.

   Wedge the spare, middle connector into the space between the boards to get it out of the way.
7. Insert the new Control Computer modules and I/O boards, as indicated in the following table.

   Before installing the disk drives, remove the three terminating resistors (labeled Z1, Z2, and Z3) from the disk drive, and save them; see the appropriate figure provided in this chapter.

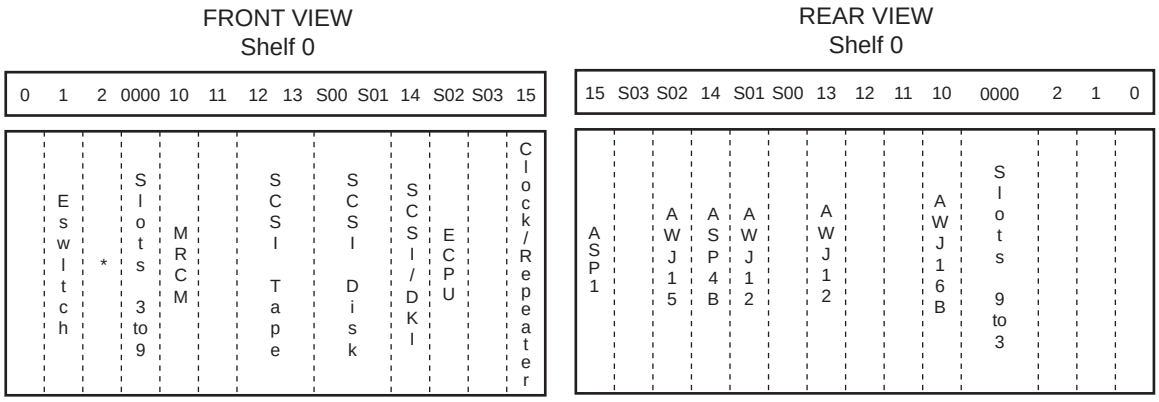
| CPU System to *Datakit* II VCS Release 6.0 ECPU System Model 2000— Modules and I/O Boards Installed | | | | |
|---|---|---|---|---|
| Slot Number | | Type | Module | I/O Board |
| Shelf 0 | Shelf 1 | | | |
| 1, 2 | — | Eswitch | TN2099 | — |
| S01 | S01 | Disk | TN2175B | |
| S02 | S06 | ECPU | MC1D138A1 | |
| 14 | 30 | SCSI/DKI | UN635B | ASP4B |

   Check that the switch on the faceplate of the Eswitch (TN2099) module is set to ENABL and that the switch on the faceplate of the SCSI/DKI (UN635B) is set to DIAG.

**PROCEDURE 7-23. Model 2000 Hardware: CPU System to *Datakit* II VCS Release 6.0 ECPU System** (continued)

8. Verify that the new modules are in the correct slots for your configuration; see the following figures.
9. Go to the procedure for Verifying the Hardware Installation.

   After verifying the installation, continue with Step 5B, Upgrading the *Datakit* II VCS Software to a New Release, and choose the appropriate procedure for your configuration.




* Optional redundant Eswitch
Note: Slots 10 and 11 have configuration limitations.

| Allowable Configurations | Slot Limitations | |
|---|---|---|
| | 10 | 11 |
| 1. | TN | TN |
| 2. | UN | empty |
| 3. | MRCM | empty |

**FIGURE 7-15. Model 2000 Slot Assignments: *Datakit* II VCS Release 6.0 ECPU System Single Control Computer**

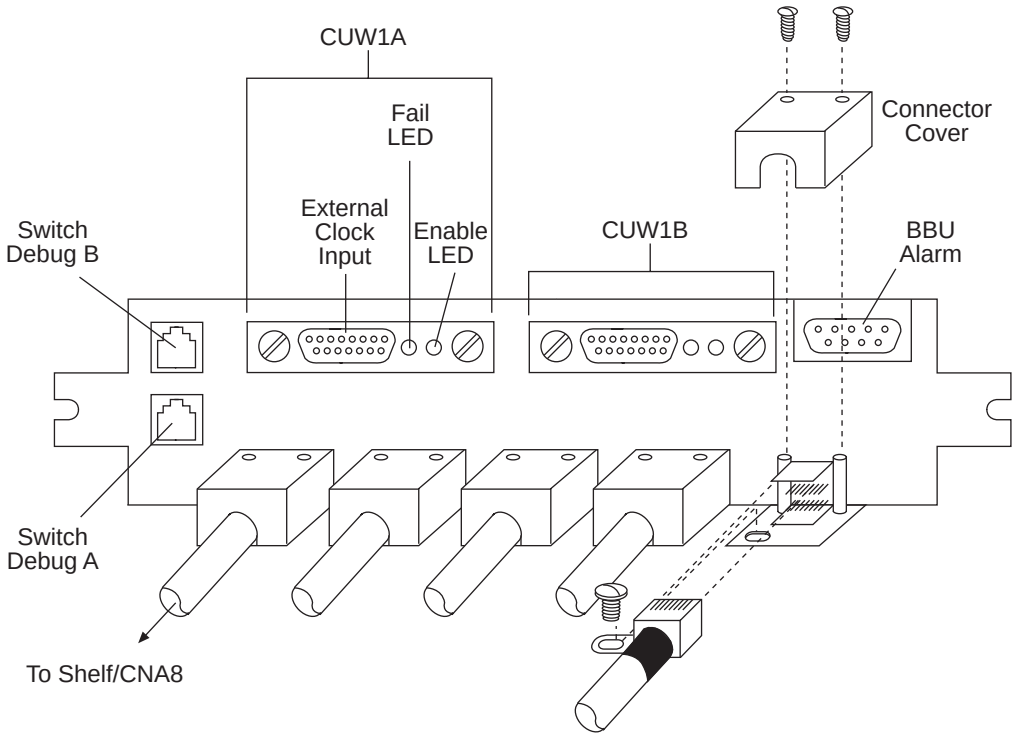



**FIGURE 7-16. Model 2000 Slot Assignments: *Datakit* II VCS Release 6.0 ECPU System Dual Control Computers**

### PROCEDURE 7-24. Modular Cabinet Hardware: ECPU System to *Datakit* II VCS Release 6.0 CCM System

**Application:** To upgrade the ECPU system in a modular cabinet to a *Datakit* II VCS Release 6.0 CCM system.

**Switches:** CC0: DIAG; CC1: DIAG.

**Requirements:** Preserve the existing database before starting the upgrade; see the procedure provided in this chapter.

**CAUTION:** Wear a properly grounded ESD wrist strap when handling modules and I/O boards.

1. Enter the following command sequence to bring down the Control Computer.

```
CC0> stop

*** Trying To Boot From Primary Disk ***

A RECOVERY REBOOT
 Reason: SOFTWARE INITIATED BY ADMINISTRATOR

TYPE ? for help
LOADER> monitor

*** DKC Loader Monitor 3.0.1 ***
. . .
MONITOR>
```

2. *For a dual Control Computer system only:* enter the following command sequence to stop the standby.

```
MONITOR> [Escape] [Escape]
MRCM> connect standby
SC1> stop
. . .
LOADER> mon
MONITOR>
```

### PROCEDURE 7-24. Modular Cabinet Hardware: ECPU System to *Datakit* II VCS Release 6.0 CCM System (continued)

3. First, remove the Control Computer modules from the front of the shelf, and then the I/O boards from the back of the shelf, as indicated in the following table.

**ECPU System to *Datakit* II VCS Release 6.0 CCM System Modular Cabinet—Modules and I/O Boards Removed**

| Slot Number | | Type | Module | I/O Board |
|---|---|---|---|---|
| Shelf 0 | Shelf 1 | | | |
| 13 | 29 | ECPU | MC1D138A1 | AWJ15 |
| 14 | 30 | SCSI/DKI | UN635 | ASP4B |
| 11 | 27 | Disk | TN2175 | AWJ12* |
| | — | Tape | TN2097 | ASP8 |

* If using an external tape drive, save the AWJ12 until the database is retrieved.

**NOTE:** Keep the old 40MB tape drive at hand because you will use it later to retrieve the database.

If you have an external tape drive, leave the AWJ12 I/O board in the node until later to use when retrieving the database.

Check to make sure that the 40MB tape drive has the terminating resistors installed.

All the other modules and I/O boards can be packaged for recycling.

4. Insert the new modules and I/O boards, as indicated in the following table.

**ECPU System to *Datakit* II VCS Release 6.0 CCM System Modular Cabinet—Modules and I/O Boards Installed**

| Slot Number | | Type | Module | I/O Board |
|---|---|---|---|---|
| Shelf 0 | Shelf 1 | | | |
| 11-12 | — | Tape (internal)** | TN2233 | CSD9 |
| — | — | Tape (external) | ED3P325-30,G407 | |
| 13† | 29† | CCM | TN2235 | CTS1 (MRCIO)**<br>CTS2 (no MRC) |
| 14† | 30† | CCM | TN2235 | CTS1 (MRCIO)**<br>CTS2 (no MRC) |

* Optional redundant Eswitch.

** The internal tape drive can go in any two slots, depending on the cable length.

† Any *magic* slot in the node may be used for the controller: for example, 13, 14, 29, 30, 45, 46.

†† A dual CCM system uses both CTS1 and CTS2; a single CCM system uses one or the other.

5. Insert a CSD9 I/O board in the slot behind where the tape drive will reside; for example, in slot 12.
6. Insert the new tape drive in its designated slot in front of the CSD9.

   The tape drive overlaps one additional slot; for example, slot 11, if the module is placed in slot 12.
7. *For a single CCM system:* Insert either the CTS1 (MRCIO) or CTS2 (no MRC) I/O board for the new CCM behind slots 13 or 14.

   *For a dual CCM system:*

   For two CCMs in the same cabinet, use slots 13 and 14. For example: In a node with empty slots and no I/O boards in slots 13 and 14, insert a CTS1 (MRCIO) into the back of slot 13, and a CTS2 (no MRC) in the back of slot 14.

   For two CCMs in adjacent cabinets, use slots 14 and 30.

   Cable the two I/O boards together, starting with the bottom SCSI port of the CTS1 and working up to the top (see appropriate figures in **Chapter 2**), as follows:

   a. Connect SCSI 1 of CTS1 to SCSI 0 of CTS2.
   b. Connect the A1B1C1 port of CTS1 to A1B1C1 port of CTS2.
   c. Connect the power port of CTS1 to power port of CTS2.
   d. Connect the ABM cable of CTS1.
   e. Connect SCSI 0 of CTS1 to SCSI 1 of CTS2.
   f. Connect the console to the A port of the ABM cable.
8. *For a single CCM system:*

   a. With the CCM controller mode switch in the DISAB position, insert the module into the selected slot; wait approximately 5 seconds for the disk drive to spin up and set the controller mode switch to the DIAG position.
   b. If using CTS1, connect the ABM cable to ports A, B, and M; if using CTS2, connect the AB cable to ports A and B.
   c. Check that port A displays the **`MONITOR>`** prompt.

*For a dual CCM system:*

a. With the CCM controller mode switch in the DISAB position, insert the first CCM (0) into the selected slot; wait approximately 5 seconds for the disk drive to spin up, and set the controller mode switch in the DIAG position.

b. With the CCM controller mode switch in the DISAB position, insert the second CCM (1) into the selected slot; wait approximately 5 seconds for the disk drive to spin up, and set the controller mode switch in the DIAG position.

9. Check that port M displays the **`MRC>`** prompt and that port A displays the **`MONITOR>`** prompt.

9. To cable the tape drive:

   *For a single CCM system:* Cable the tape drive to SCSI bus 1 (bottom connector on CTS1 or CTS2).

   *For a dual CCM system:* Cable the tape drive to SCSI bus 1 (the bottom connector on CTS1) in slot 13. (The connector is stackable).

10. Verify that the new modules are in the correct slots for your system; see the appropriate figures provided in this chapter.

11. When you have finished installing the new components, apply the address and slot labels supplied with the new equipment.

    *This completes the hardware installation for a CCM system.*

12. Go to the procedure for Verifying the Hardware Installation.

    After verifying the installation, continue with Step 5B, Upgrading the *Datakit* II VCS Software to a New Release, and choose the appropriate procedure for your system.

### PROCEDURE 7-25. Modular Cabinet Hardware: ECPU System to *Datakit* II VCS Release 6.0 ECPU System

**Application:** To upgrade a *Datakit* II VCS Release 3.0, 3.1, and 4.0 ECPU system in a modular cabinet to a Release 6.0 ECPU system. A Release 5.0 ECPU system does not need a hardware upgrade.

**Requirements:** Preserve the existing database before starting the upgrade; see the appropriate procedure provided in this chapter.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules or I/O boards.

1. Enter the following command sequence to stop the Control Computer.

```
CC0> stop
.  .  .
LOADER> monitor
.  .  .
MONITOR>
```

2. *For a dual Control Computer system only:* enter the following command sequence to stop the standby Control Computer.

```
MONITOR> Escape Escape
MRC> connect standby
SC1> stop
.  .  .
LOADER> monitor
. . .
MONITOR>
```

**PROCEDURE 7-25. Modular Cabinet Hardware: ECPU System to *Datakit* II VCS Release 6.0 ECPU System** (continued)

2. Remove the Control Computer module indicated in the following table.

| ECPU System to *Datakit* II VCS Release 6.0 ECPU System Modular Cabinet—Modules and I/O Boards Removed | | | |
|---|---|---|---|
| Slot Number | | Type | Module |
| Shelf 0 | Shelf 1 | | |
| 11 | 27 | Disk | TN2098 or TN2175 |

3. Insert the new module as indicated in the following table.

   Before installing the disk drives, remove the three terminating resistors (labeled Z1, Z2, and Z3) from the disk drive, and save them; see the appropriate figure provided in this chapter.

| ECPU System to *Datakit* II VCS Release 6.0 ECPU System Modular Cabinet—Modules and I/O Boards Installed | | | |
|---|---|---|---|
| Slot Number | | Type | Module |
| Shelf 0 | Shelf 1 | | |
| 11 | 27 | Disk | TN2175B |

4. Verify that the new modules are in the correct slots for a modular cabinet; see the appropriate figures provided in this chapter.
5. Go to the procedure for Verifying the Hardware Installation.

   After verifying the installation, continue with Step 5B, Upgrading the *Datakit* II VCS Software to a New Release, and choose the appropriate procedure for your system.

### PROCEDURE 7-26. Model 2000 Hardware: ECPU System to *Datakit* II VCS Release 6.0 ECPU System

**Application:** To upgrade the ECPU system in a Model 2000 cabinet to a *Datakit* II VCS Release 6.0 ECPU system.

**Requirements:** Preserve the existing database before starting the upgrade; see the appropriate procedure provided in this chapter.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules or I/O boards.

1. Enter the following command sequence to stop the Control Computer.

```
CC0> stop
.  .  .
LOADER> monitor
.  .  .
MONITOR>
```

2. *For a dual Control Computer system only:* enter the following command sequence to stop the standby Control Computer.

```
MONITOR> Escape Escape
MRC> connect standby
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

**PROCEDURE 7-26. Model 2000 Hardware: ECPU System to *Datakit* II VCS Release 6.0 ECPU System** (continued)

3. Remove the disk module indicated in the following table.

| ECPU System to *Datakit* II VCS Release 6.0 ECPU System Model 2000—Modules and I/O Boards Removed | | | |
|---|---|---|---|
| Slot Number | | Type | Module |
| Shelf 0 | Shelf 1 | | |
| 11 | 27 | Disk | TN2098 or TN2175 |

4. Insert the new disk as indicated in the following table.

   Before installing the disk drives, remove the three terminating resistors (labeled Z1, Z2, and Z3) from the disk drive, and save them; see the appropriate figure provided in this chapter.

| ECPU System to *Datakit* II VCS Release 6.0 ECPU System Model 2000— Modules and I/O Boards Installed | | | |
|---|---|---|---|
| Slot Number | | Type | Module |
| Shelf 0 | Shelf 1 | | |
| 11 | 27 | Disk | TN2175B |

5. Verify that the modules and I/O boards are in the correct slots for a Model 2000 cabinet; see see the appropriate figures provided in this chapter.
6. Go to the procedure for Verifying the Hardware Installation.

   After verifying the installation, continue with Step 5B, Upgrading *Datakit* II VCS the Software to a New Release, and choose the appropriate procedure for your system.

Use the following procedure to verify that the hardware is operational for all system configurations.

### PROCEDURE 7-27. Verifying the *Datakit* II VCS Hardware Installation

1. Verify that the controller mode switch (on the CCM or SCSI/DKI faceplate) is in the DIAG position.
2. Verify that the console is in monitor mode. If the **MONITOR>** prompt is not displayed, check the console connection and hardware installation.
3. Run Control Computer firmware diagnostics.
   a. *For a CCM system:*
      – with a single CCM, execute the command **di e5cd**
      – with a dual CCM, execute the command **di f5cd**
   b. *For an ECPU system:*
      – if the node does *not* have a secondary disk and tape, execute the command **di e7cf**
      – if the node has a secondary disk/tape, execute the command **di f7cf**

      **NOTE:** These diagnostic commands will take 4 to 6 minutes to complete.

5. Verify that all diagnostics have **PASSED** .

   If the diagnostics fail, go to the procedures in **Chapter 6** for Running Monitor Mode Diagnostics to rerun specific diagnostics and Recovering from Monitor Mode Diagnostic Failure to resolve problems.
6. Continue with the next step to upgrade the software.

## Step 5A. Upgrading the BNS-2000 Software to a New Release

The procedures listed below for upgrading software on specific Control Computer configurations involve the following general steps:

1. installing the new software
2. retrieving the database
3. upgrading the database
4. rebooting the node
5. entering the software registration key

Choose the procedure that is appropriate for your configuration:

- Upgrading a BNS-2000 Software Release: Single Control Computer
- Upgrading a BNS-2000 Software Release: Dual Control Computer

**NOTE:** The term *controller mode switch*, in the following software procedures, refers to the switch on the faceplate of the CCM or SCSI/DKI, depending on the hardware in your upgraded node.

---

### PROCEDURE 7-28. Upgrading a BNS-2000 Software Release: Single Control Computer

**Application:** To upgrade software from one release to another release for a single Control Computer configuration.

**Requirements:** The console connected to port A should display the **`MONITOR>`** prompt, and the port A baud rate should be 9600 bps.

For a node with a CCM and DDS tape drive, a backup 40MB tape drive must be connected to the node, and a backup 40MB tape must contain the preserved database.

This procedure follows the basic steps used during software installation.

1. To install the new software release onto disk 0 of Control Computer 0 (CC0), insert the software release tape into the single tape drive attached to the secondary SCSI bus (1) for the CCM system; or into tape drive 0 for the ECPU system.

   Wait for the yellow LED (CCM system) or red LED (ECPU system) to go out.

2. Enter the commands shown in the screens below, depending on your type of system.

   The first **dcc** command executes for about one minute before the **`MONITOR>`** prompt returns.

   The second **dcc** command executes for about *50 to 60 minutes* (ECPU system) or 3 to 5 minutes (CCM system); the **`Begin verify`** message appearing about halfway through.

**PROCEDURE 7-28. Upgrading a BNS-2000 Software Release: Single Control Computer** (continued)

As the copy and verify proceeds, the yellow LEDs (CCM system) or red LEDs (ECPU system) on the disk and on the tape drives light alternately.

*For a CCM system,* enter the following commands:

```
MONITOR> dcc st/1 p/15
Begin verify
MONITOR> dcc st/2 p/0
Begin verify
MONITOR>
```

**NOTE:** In a CCM system, standard cabling connects the tape to the secondary SCSI port, indicated by the "st" used with the **dcc** commands.

*For an ECPU system,* enter the following commands:

```
MONITOR> dcc t/4 p/15
Begin verify
MONITOR> dcc t/1 p/0
Begin verify
MONITOR>
```

**NOTE:** When a disk or tape is accessed, after a power-up or a system reset, a message similar to the following may appear after the **dcc** commands are entered:
**`sense: 70 00 06 00 00 0f 00 14 00 00 00 00 28 00 00`** .
Ignore this information.

If the disk or tape cannot be accessed, an error message,
**`Primary Tape/Disk not ready (n)`**,
appears in place of **`Begin verify`** ; refer to the *Messages Reference*.

When the **`MONITOR>`** prompt reappears after the second **dcc** command, loading the software to disk 0 is complete.

3. Remove the release tape by pressing the eject button on the tape drive to disengage the tape from the drive mechanism.

   Return the tape to its protective case.

**PROCEDURE 7-28. Upgrading a BNS-2000 Software Release: Single Control Computer** (continued)

4. *For an ECPU system upgraded to a BNS-2000 Release 5.0 ECPU system:*

   Set up the release file system by entering the following command sequence.

   **NOTE:** This step will take about 30 minutes to complete.

```
MONITOR> boot
LOADER> run
. . .
<DBG> :c
. . .
<STARTUP> $ sh
INFO:  This file system contains compressed files.
       Run setuprel to set up the release before rebooting.

Entering the stand-alone shell

MINI-SH:  What can I do for you?
UTILITY> setuprel
. . .
The release is ready to run.  Enter the reboot command.
UTILITY>
```

   Reboot the Control Computer 0 (CC0) as shown in the next step.

5. Boot Control Computer 0 (CC0) by entering the following command sequence.

```
UTILITY> reboot
LOADER> run
. . .
<DBG> :c
. . .
<STARTUP> $  Return
. . .
CC0>
```

**PROCEDURE 7-28. Upgrading a BNS-2000 Software Release: Single Control Computer** (continued)

6. *For a CCM system only:* Connect the tape drive to the node:

   **NOTE:** For installations using the external tape drive, check to make sure that the 40MB tape drive has terminating resistors installed.

   a. *For an internal DDS tape drive,* replace the DDS tape and tape drive with the 40MB tape and tape drive by plugging the 40MB tape drive into the slot with the CSD9 I/O board; the red LED for a SCSI bus fault will be lit on the board.

   b. *For an external DDS tape drive,* plug the 40MB tape drive into the slot with the AWJ12 I/O board, and use the cable from the external drive to connect the secondary SCSI bus on CC0 to the AWJ12.

7. Retrieve the database from the backup tape to prepare the Control Computer for the database upgrade.

   *For an ECPU system upgraded to a Release 5.0 CCM system:*

   a. Insert the backup tape with the preserved database into the 40MB tape drive and enter the following command sequence.

```
CC0> utilsh
. . .
MINI-SH: What can I do for you?
UTILITY> chgtape
Linking 40MB tape to backup tape device
Are you sure you want to do this (enter y for yes)? y
UTILITY>
```

   b. Retrieve the preserved database from the backup tape to prepare the Control Computer for the database upgrade, by entering **retrieve tape 1**.

```
UTILITY> exit
CC0> retrieve tape 1
CC0>
```

**PROCEDURE 7-28. Upgrading a BNS-2000 Software Release: Single Control Computer** (continued)

c. When the database retrieval is complete, remove the tape from the drive.

d. Take out the 40MB tape drive and package it for recycling.

If using an internal DDS tape drive, plug it in.

If using an external DDS tape drive, remove the AWJ12 I/O board, package it for recycling, and reconnect the SCSI cable.

*For an ECPU system upgraded to a Release 5.0 ECPU system:*

a. Insert the backup tape containing the preserved database into tape drive 0.

b. When the red LED goes out on the tape drive, enter the **retrieve tape 0** command.

c. When the database retrieval is complete, remove the tape from the drive.

8. Use the following command sequence to upgrade the database.

**NOTE:** The **dbupgrd** command will take 6 to 30 minutes to complete depending on the size of the database.

```
CC0>  initialize standalone
. . .
LOADER> run
<DBG> :c
. . .
UTILITY>  dbupgrd
. . .
UTILITY>
```

**WARNING:** If **dbupgrd** fails, **DO NOT PROCEED** because it may not be possible to recover the node configuration database.

For assistance, call 1-800-WE-2-CARE.

**PROCEDURE 7-28. Upgrading a BNS-2000 Software Release: Single Control Computer** (continued)

9. Create the standby file system by entering the **copystby** command.

```
UTILITY> copystby
. . .
UTILITY>
```

**NOTE:** The **copystby** command takes about 5 minutes to execute.

10. Set the controller mode switch on Control Computer 0 (CC0) to ENABL.
11. To reboot Control Computer 0 (CC0), enter the following command sequence.

```
UTILITY> reboot
Are you sure? yes
. . .
CC0>
```

**NOTE:** This reboot will take 2 to 20 minutes depending on the number of downloadable modules in the node.

12. Use the **install registration** command (see the **Node Operations** chapter) to register the release software.

    *For a CCM system:* You must use the new node ID (the serial number on the CCM) to register the node.

    *For an ECPU system:* If the SCSI/DKI module was replaced as part of the hardware upgrade, you must use the new node ID to register the node.

    **NOTE:** Before continuing, wait until all the modules have received a new download and are restored to service.

13. Make any necessary changes to node information in the database with the **change node** command; for example, you may need to change the controller addresses.

**PROCEDURE 7-28. Upgrading a BNS-2000 Software Release: Single Control Computer** (continued)

14. Back up the node configuration database to preserve the node registration and save the database.

```
CC0> sync
CC0> backup save 0
CC0>
```

    Optionally, you can also save the database to tape or to a *StarKeeper* II NMS host; see the appropriate procedure in this chapter to save the database to backup.

15. Check the time using the **display time** command. If necessary, use the **set time** command to reset the time for Control Computer 0 as follows.

```
CC0> set time
TIME[HHMMSS] +(211109):
DATE[YYMMDD] +(960130):
CC0>
```

16. Use the **verify node** command to verify that the new release and build are active on the node.

*This completes the software release upgrade for a single Control Computer configuration.*

**NOTE:** If using *StarKeeper* II NMS, be sure to perform the necessary operations for updating the node information on *StarKeeper*.

### PROCEDURE 7-29. Upgrading a BNS-2000 Software Release: Dual Control Computers

**Application:** To upgrade software from one release to another release for a dual Control Computer configuration.

**Requirements:** The console connected to port A should display the **MONITOR>** prompt, and the port A baud rate should be 9600 bps.

For a node with a CCM system and DDS tape drive, a backup 40MB tape drive must be connected to the node, and a backup 40MB tape must contain the preserved database.

**Status**: The node is accessed via a console connected to port A of the MRC or from port M of the MRC; the console is connected via the MRC to Control Computer 0 (CC0); automatic recovery is set to **recovery off** and auto backup is *off*.

This method follows the basic steps used during software installation.

1. To install the new software release on Control Computer 0 (CC0), follow steps 2 and 3 in procedure for Upgrading a Software Release: Single Control Computer.
2. Remove the release tape by pressing the eject button on the tape drive to disengage the tape from the drive mechanism.

   Return the tape to its protective case.
3. *For an ECPU system upgraded to a BNS-2000 Release 5.0 ECPU system:*

   Set up the release file system by entering the following command sequence.

   **NOTE:** This step will take about 30 minutes to complete.

```
MONITOR> boot
LOADER> run
. . .
<DBG> :c
. . .
<STARTUP> $ sh
INFO:  This file system contains compressed files.
       Run setuprel to set up the release before rebooting.

Entering the stand-alone shell

MINI-SH:  What can I do for you?
UTILITY> setuprel
. . .
The release is ready to run.  Enter the reboot command.
UTILITY>
```

**PROCEDURE 7-29. Upgrading a BNS-2000 Software Release: Dual Control Computers** (continued)

Reboot the Control Computer 0 (CC0) as shown in the next step.

4. Boot Control Computer 0 (CC0) by entering the following command sequence.

```
UTILITY> reboot
. . .
LOADER> run
<DBG> :c
. . .
<STARTUP> $  Return
CC0>
. . .
```

5. *For a CCM system only:* Connect the tape drive to the node:

   **NOTE:** For installations using the external tape drive, check to make sure that the 40MB tape drive has terminating resistors installed.

   a. *For an internal DDS tape drive*, replace the DDS tape and tape drive with the 40MB tape and tape drive by plugging the 40MB tape drive into the slot with the CSD9 I/O board; the red LED for a SCSI bus fault will be lit on the board.

   b. *For an external DDS tape drive*, plug the 40MB tape drive into the slot with the AWJ12 I/O board, and use the cable from the external drive to connect the secondary SCSI bus on CC0 to the AWJ12.

6. Retrieve the database from the backup tape to prepare the Control Computer for the database upgrade.

**PROCEDURE 7-29. Upgrading a BNS-2000 Software Release: Dual Control Computers** (continued)

*For an ECPU system upgraded to a Release 5.0 CCM system:*

a. Insert the backup tape with the preserved database into the 40MB tape drive, and enter the following command sequence.

```
CC0> utilsh
. . .
MINI-SH: What can I do for you?
UTILITY> chgtape
Linking 40MB tape to backup tape device
Are you sure you want to do this (enter y for yes)? y
UTILITY>
```

b. Retrieve the preserved database from the backup tape to prepare the Control Computer for the database upgrade, by entering **retrieve tape 1**.

```
UTILITY> exit
CC0> retrieve tape 1
CC0>
```

c. When the database retrieval is complete, remove the tape from the drive.

d. Take out the 40MB tape drive and package it for recycling.

   If using an internal DDS tape drive, plug it in. The red LED for a SCSI bus fault should no longer be on.

   If using an external DDS tape drive, remove the AWJ12 I/O board, package it for recycling, and reconnect the SCSI cable.

*For an ECPU system upgraded to a BNS-2000 Release 5.0 ECPU system:*

a. Insert the backup tape containing the preserved database into tape drive 0.

b. When the red LED goes out on the tape drive, enter the **retrieve tape 0** command.

c. When the database retrieval is complete, remove the tape from the drive.

**PROCEDURE 7-29. Upgrading a BNS-2000 Software Release: Dual Control Computers** (continued)

7. Use the following command sequence to upgrade the database.

   **NOTE:** The **dbupgrd** command will take 6 to 30 minutes to complete depending on the size of the database.

```
CC0>  initialize standalone
. . .
LOADER> run
<DBG> :c
. . .
UTILITY>  dbupgrd
. . .
UTILITY>
```

   **WARNING:** If **dbupgrd** fails, **DO NOT PROCEED** because it may not be possible to recover the node configuration database.

   For assistance, call 1-800-WE-2-CARE.

8. Create the standby file system by entering the **copystby** command.

```
UTILITY> copystby
. . .
UTILITY>
```

   **NOTE:** The **copystby** command takes about 5 minutes to execute.

9. Move the controller mode switch on Control Computer 0 (CC0) to the ENABL position.

   Leave the controller mode switch on Control Computer 1 (CC1) in the DIAG position.

**PROCEDURE 7-29. Upgrading a BNS-2000 Software Release: Dual Control Computers** (continued)

10. To reboot Control Computer 0 (CC0), enter the following command sequence.

```
UTILITY> reboot
Are you sure? yes
. . .
CC0>
```

**NOTE:** This reboot will take 2 to 20 minutes depending on the number of downloadable modules in the node.

11. Use the **install registration** command procedure in the **Node Operations** chapter to register the release software.

    *For a CCM system:* Use the new node ID (the serial number on the CCM) to register the node.

    *For an ECPU system:* If the SCSI/DKI module was replaced as part of the hardware upgrade, use the new node ID to register the node.

**NOTE:** Before continuing, wait until all the modules have received a new download and are restored to service.

12. If the CCMs have been moved to new slots, use the **change node** command to fix the slot addresses, and then reboot.

    Do not set auto backup on yet; see step 19.

13. Use the following command sequence to update disk 1.

```
CC0>  utilsh
UTILITY> dupdisk
. . .
UTILITY> exit
CC0>
```

**NOTE:** The **dupdisk** command takes about 15 minutes on an ECPU system and about 5 minutes on a CCM system. The file systems are checked after they are copied and messages are printed indicating the adjustments being made because the primary file system was active during the copy.

**PROCEDURE 7-29. Upgrading a BNS-2000 Software Release: Dual Control Computers** (continued)

14. Check the time using the **display time** command. If necessary, use the **set time** command to reset the time for Control Computer 0 (CC0), as follows.

```
CC0> set time
TIME[HHMMSS] +(211109):
DATE[YYMMDD] +(960130):
CC0>
```

15. Use the **change node** command to set auto backup to *on*.
16. Backup the node configuration database to preserve the node registration and save the database.

```
CC0> sync
CC0> backup standby
CC0> backup save 0
CC0>
```

    Optionally, you can also save the database to tape or to a *StarKeeper* II NMS host. See Procedure 7-4. Preserving the Database.

17. Move the controller mode switch in Control Computer 1 (CC1) to ENABL.
18. Use the MRC **switchover** command to make Control Computer 1 the active Control Computer.

```
CC0> stop
. . .
LOADER> [Escape] [Escape]
MRC> switchover
. . .
CC1>
```

**PROCEDURE 7-29. Upgrading a BNS-2000 Software Release: Dual Control Computers** (continued)

19. Now switch back to Control Computer 0.

```
CC1> stop
. . .
LOADER> Escape Escape
MRC> switchover
. . .
CC0>
```

20. Use the following command sequence to set automatic recovery to *on*.

```
CC1> Escape Escape
MRC> set recovery on
MRC>
```

21. Use the **verify node** command to verify that the new release and build are active on the node.

*This completes the software release upgrade for a dual Control Computer configuration.*

**NOTE:** If using *StarKeeper* II NMS, be sure to perform the necessary operations for updating the node information on *StarKeeper*.

## Step 5B. Upgrading the *Datakit* II VCS Software to a New Release

The procedures listed below for upgrading software on specific Control Computer configurations involve the following general steps:

1. installing the new software
2. retrieving the database
3. upgrading the database
4. rebooting the node
5. entering the software registration key

Choose the procedure that is appropriate for your configuration:

- Upgrading a *Datakit* II VCS Software Release: Single Control Computer
- Upgrading a *Datakit* II VCS Software Release: Dual Control Computer

**NOTE:** The term *controller mode switch*, in the following software procedures, refers to the switch on the faceplate of the CCM or SCSI/DKI, depending on the hardware in your upgraded node.

---

### PROCEDURE 7-30. Upgrading a *Datakit* II VCS Software Release: Single Control Computer

**Application:** To upgrade software from one release to another release for a single Control Computer configuration.

**Requirements:** The console connected to port A should display the **`MONITOR>`** prompt, and the port A baud rate should be 9600 bps.

For a node with a CCM and DDS tape drive, a backup 40MB tape drive must be connected to the node, and a backup 40MB tape must contain the preserved database. This procedure follows the basic steps used during software installation.

1. Verify that the controller mode switch of CC0 is in DIAG.
2. To install the new software release onto disk 0 of Control Computer 0 (CC0), insert the software release tape into the single tape drive attached to the secondary SCSI bus (1) for the CCM system; or into tape drive 0 for the ECPU system.

   Wait for the yellow LED (CCM system) or red LED (ECPU system) to go out.
3. Enter the commands shown in the screens below, depending on your type of system.

   The first **dcc** command executes for about one minute before the **`MONITOR>`** prompt returns.

**PROCEDURE 7-30. Upgrading a *Datakit* II VCS Software Release: Single Control Computer** (continued)

The second **dcc** command executes for about *50 to 60 minutes* (ECPU system) or 3 to 5 minutes (CCM system); the **`Begin verify`** message appearing about halfway through.

As the copy and verify proceeds, the yellow LEDs (CCM system) or red LEDs (ECPU system) on the disk and on the tape drives light alternately.

*For a CCM system,* enter the following commands:

```
MONITOR> dcc st/1 p/15
Begin verify
MONITOR> dcc st/2 p/0
Begin verify
MONITOR>
```

**NOTE:** In a CCM system, standard cabling connects the tape to the secondary SCSI port, indicated by the "st" used with the **dcc** commands.

*For an ECPU system,* enter the following commands:

```
MONITOR> dcc t/4 p/15
Begin verify
MONITOR> dcc t/1 p/0
Begin verify
MONITOR>
```

**NOTE:** When a disk or tape is accessed, after a power-up or a system reset, a message similar to the following may appear after the **dcc** commands are entered: **`sense: 70 00 06 00 00 0f 00 14 00 00 00 00 28 00 00`**. Ignore this information.

If the disk or tape cannot be accessed, an error message, **`Primary Tape/Disk not ready (n)`**, appears in place of **`Begin verify`**; refer to the *Messages Reference*.

When the **`MONITOR>`** prompt reappears after the second **dcc** command, loading the software to disk 0 is complete.

4. Remove the release tape by pressing the eject button on the tape drive to disengage the tape from the drive mechanism.

**PROCEDURE 7-30. Upgrading a *Datakit* II VCS Software Release: Single Control Computer** (continued)

Return the tape to its protective case.

5. Boot Control Computer 0 (CC0) by entering the following command sequence.

```
MONITOR> boot
LOADER> run
. . .
<DBG> :c
. . .
<STARTUP> $  Return
. . .
CC0>
```

6. *For a CCM system only:* Connect the tape drive to the node:

   **NOTE:** Check to make sure that the 40MB tape has terminating resistors installed.

   a. *For an internal DDS tape drive,* replace the DDS tape and tape drive with the 40MB tape and tape drive by plugging the 40MB tape drive into the slot with the CSD9 I/O board; the red LED for a SCSI bus fault will be lit on the board.

   b. *For an external DDS tape drive,* plug the 40MB tape drive into the slot with the AWJ12 I/O board, and use the cable from the external drive to connect to SCSI bus 1 on CC0.

7 Retrieve the database from the backup tape to prepare the Control Computer for the database upgrade.

   *For a CPU or ECPU system upgraded to a Datakit* II VCS Release 6.0 CCM system:

   a. Insert the backup tape with the preserved database into the 40MB tape drive, and enter the following command sequence.

```
CC0> utilsh
. . .
MINI-SH: What can I do for you?
UTILITY> chgtape
Linking 40MB tape to backup tape device
Are you sure you want to do this (enter y for yes)? y
UTILITY>
```

**PROCEDURE 7-30. Upgrading a *Datakit* II VCS Software Release: Single Control Computer** (continued)

b. Retrieve the preserved database from the backup tape to prepare the Control Computer for the database upgrade, by entering **retrieve tape 1**.

```
UTILITY> exit
CC0> retrieve tape 1
CC0>
```

c. When the database retrieval is complete, remove the tape from the drive.

d. Take out the 40MB tape drive and package it for recycling.

If using an internal DDS tape drive, plug it in; if not, remove the AWJ12 I/O board and package it for recycling.

*For a CPU or ECPU system upgraded to a Release 6.0 ECPU system:*

a. Insert the backup tape containing the preserved database into tape drive 0.

b. When the red LED goes out on the tape drive, enter the **retrieve tape 0** command.

c. When the database retrieval is complete, remove the tape from the drive.

8 Use the following command sequence to upgrade the database.

**NOTE:** The **dbupgrd** command will take 6 to 30 minutes to complete depending on the size of the database.

```
CC0> initialize standalone
. . .
LOADER> run
<DBG> :c
. . .
UTILITY>  dbupgrd
. . .
UTILITY>
```

**WARNING:** If **dbupgrd** fails, **DO NOT PROCEED** because it may not be possible to recover the node configuration database.

For assistance, call the
1-800-WE-2-CARE (in the U.S.).

**PROCEDURE 7-30. Upgrading a *Datakit* II VCS Software Release: Single Control Computer** (continued)

9. Create the standby file system by entering the **copystby** command.

```
UTILITY> copystby
. . .
UTILITY>
```

**NOTE:** The **copystby** command takes about 5 minutes to execute.

10. Move the controller mode switch on Control Computer 0 (CC0) to the ENABL position.
11. To reboot Control Computer 0 (CC0), enter the following command sequence.

```
UTILITY> reboot
Are you sure? yes
. . .
CC0>
```

**NOTE:** This reboot will take 2 to 20 minutes depending on the number of downloadable modules in the node.

12. Use the appropriate procedure to register the release software.

**NOTE:** Before continuing, wait until all the modules have received a new download and are restored to service.

13. Make any necessary changes to node information in the database with the **change node** command; for example, you may need to change the Controller or the Eswitch address.
14. Check the time using the **display time** command. If necessary, use the **set time** command to reset the time for Control Computer 0 (CC0), as follows.

```
CC0> set time
TIME[HHMMSS] +(211109):
DATE[YYMMDD] +(960130):
CC0>
```

**PROCEDURE 7-30. Upgrading a *Datakit* II VCS Software Release: Single Control Computer** (continued)

15. Backup the node configuration database to preserve the node registration and save the database.

```
CC0> sync
CC0> backup standby
CC0> backup save 0
CC0>
```

    Optionally, you can also save the database to tape or to a *StarKeeper* II NMS host; see the appropriate procedure in this chapter.

16. Use the **verify node** command to verify that the new release and build are active on the node.

*This completes the software release upgrade for a single Control Computer configuration.*

### PROCEDURE 7-31. Upgrading a *Datakit* II VCS Software Release: Dual Control Computers

**Application:** To upgrade software from one release to another release for a dual Control Computer configuration.

**Requirements:** The console connected to port A should display the **MONITOR>** prompt, and the port A baud rate should be 9600 bps.

For a node with a CCM system and DDS tape drive, a backup 40MB tape drive must be connected to the node, and a backup 40MB tape must contain the preserved database.

**Status**: The node is accessed via a console connected to port A of the MRC or from port M of the MRC; the console is connected via the MRC to Control Computer 0 (CC0); automatic recovery is set to **recovery off** and auto backup is *off*.

This method follows the basic steps used during software installation.

1. Verify that the controller mode switches on CC0 and CC1 are in DIAG.
2. To install the new software release on Control Computer 0 (CC0), follow steps 2 and 3 in Procedure 7-28.
3. Remove the release tape by pressing the eject button on the tape drive to disengage the tape from the drive mechanism.

   Return the tape to its protective case.
4. Boot Control Computer 0 (CC0) by entering the following command sequence.

```
MONITOR>  boot
. . .
LOADER> run
<DBG> :c
. . .
CC0>
```

5. Connect the tape drive to the node:

   **NOTE:** Check to make sure that the 40MB tape drive has terminating resistors installed.

   a. *For an internal DDS tape drive,* replace the DDS tape and tape drive with the 40MB tape and tape drive by plugging the 40MB tape drive into the slot with the CSD9 I/O board; the red LED for a SCSI bus fault will be lit on the board.

   b. *For an external DDS tape drive,* plug the 40MB tape drive into the slot with the AWJ12 I/O board, and use the cable from the external drive to connect to SCSI bus 1 on CC0.

**PROCEDURE 7-31. Upgrading a *Datakit* II VCS Software Release: Dual Control Computers** (continued)

6. Retrieve the database from the backup tape to prepare the Control Computer for the database upgrade.

   *For a CPU or ECPU system upgraded to a Release 6.0 CCM system:*

   a. Insert the backup tape with the preserved database into the 40MB tape drive, and enter the following command sequence.

```
CC0> utilsh
. . .
MINI-SH: What can I do for you?
UTILITY> chgtape
Linking 40MB tape to backup tape device
Are you sure you want to do this (enter y for yes)? y
UTILITY>
```

   b. Retrieve the preserved database from the backup tape to prepare the Control Computer for the database upgrade, by entering **retrieve tape 1**.

```
UTILITY> exit
CC0> retrieve tape 1
CC0>
```

   c. When the database retrieval is complete, remove the tape from the drive.

   d. Take out the 40MB tape drive and package it for recycling.

      If using an internal DDS tape drive, plug it in; if not, remove the AWJ12 I/O board and package it for recycling.

   *For a CPU or ECPU system upgraded to a Release 6.0 ECPU system:*

   a. Insert the backup tape containing the preserved database into tape drive 0.

   b. When the red LED goes out on the tape drive, enter the **retrieve tape 0** command.

   c. When the database retrieval is complete, remove the tape from the drive.

**PROCEDURE 7-31. Upgrading a *Datakit* II VCS Software Release: Dual Control Computers** (continued)

7. Use the following command sequence to upgrade the database.

   **NOTE:** The **dbupgrd** command will take 6 to 30 minutes to complete depending on the size of the database.

```
CC0> initialize standalone
. . .
LOADER> run
<DBG> :c
. . .
UTILITY>  dbupgrd
. . .
UTILITY>
```

   **WARNING:** If **dbupgrd** fails, **DO NOT PROCEED** because it may not be possible to recover the node configuration database.

   For assistance, call the
   1-800-WE-2-CARE (in the U.S.).

8. Create the standby file system by entering the **copystby** command.

```
UTILITY> copystby
. . .
UTILITY>
```

   **NOTE:** The **copystby** command takes about 5 minutes to execute.

9. Move the controller mode switch on Control Computer 0 (CC0) to the ENABL position.

   Leave the controller mode switch in Control Computer 1 (CC1) on DIAG.

**PROCEDURE 7-31. Upgrading a *Datakit* II VCS Software Release: Dual Control Computers** (continued)

10. To reboot Control Computer 0 (CC0), enter the following command sequence.

```
UTILITY> reboot
Are you sure? yes
. . .
CC0>
```

**NOTE:** This reboot will take 2 to 20 minutes depending on the number of downloadable modules in the node.

11. Use the appropriate procedure in Chapter 3 to register the release software.

    *For a CCM system:* You must use the new node ID (the serial number on the CCM) to register the node.

    *For an ECPU system:* If the SCSI/DKI module was replaced as part of the hardware upgrade, you must use the new node ID to register the node.

    **NOTE:** Before continuing, wait until all the modules have received a new download and are restored to service.

12. If the CCMs have been moved to new slots, use the **change node** command to fix the slot addresses, and then reboot.

    Do not set auto backup on yet; see step 15.

13. Use the following command sequence to update disk 1.

```
CC0>  utilsh
UTILITY> dupdisk
. . .
UTILITY> exit
CC0>
```

**NOTE:** The **dupdisk** command takes about 15 minutes on an ECPU system and about 5 minutes on a CCM system. The file systems are checked after they are copied and messages are printed indicating the adjustments being made because the primary file system was active during the copy.

**PROCEDURE 7-31. Upgrading a *Datakit* II VCS Software Release: Dual Control Computers** (continued)

14. Check the time using the **display time** command. If necessary, use the **set time** command to reset the time for Control Computer 0 (CC0), as follows.

```
CC0> set time
TIME [HHMMSS] +(211109):
DATE [YYMMDD] +(960130):
CC0>
```

15. Use the **change node** command to set auto backup to *on*.

16. Backup the node configuration database to preserve the node registration and save the database.

```
CC0> sync
CC0> backup standby
CC0> backup save 0
CC0>
```

    Optionally, you can also save the database to tape or to a *StarKeeper* II NMS host. See the appropriate procedure in this chapter.

17. Move the controller mode switch in Control Computer 1 (CC1) to ENABL.

18. Use the MRC **switchover** command to make Control Computer 1 the active Control Computer.

```
CC0> stop
. . .
LOADER> [Escape] [Escape]
MRC> switchover
. . .
CC1>
```

**PROCEDURE 7-31. Upgrading a *Datakit* II VCS Software Release: Dual Control Computers** (continued)

19. Use the following command sequence to set automatic recovery to *on*.

```
CC1>  Escape  Escape
MRC>  set recovery on
MRC>
```

20. Now switch back to Control Computer 0.

```
CC1>  stop
.  .  .
LOADER>  Escape  Escape
MRC>  switchover
.  .  .
CC0>
```

21. Remove the database tape from the tape drive.
22. Use the **verify node** command to verify that the new release and build are active on the node.

*This completes the software release upgrade for a dual Control Computer configuration.*

## Step 6. Verifying the Database Against the Original

Optionally, generate a database report using the following procedure and compare it to the database report obtained prior to the database upgrade. Correct any differences using administrative commands; see Verifying the Database in **Node Administration**.

---

### PROCEDURE 7-32. Generating a Node Configuration Database Report

**Application:** All BNS-2000 and *Datakit* II VCS nodes.

The **verify** command produces a report on each database entity specified. To capture the contents of the entire node configuration database, run **verify** commands as follows.

1 Enter **verify** for all possible command objects.

```
CC0> verify
OBJECTS [address, ..., x75]:  . . .
CC0>
```

2. Enter **verify** for all possible components of the command objects.

   For example, verifying the object *host* allows you to check all hosts administered in the database.

```
CC0> verify host
HOST [name, pattern, all +(all)]: +
. . .
CC0>
```

   The report received will show the names of groups assigned to each host, the service addresses assigned to each group, and the address level and service state of each host's address.

3. Enter **verify** for all module addresses and for the addresses of all component levels of each module type. For subordinate components, you must specify the address of the higher level connected component(s); for more details, see the module references and the *Commands Reference.*

```
CC0> verify <mod all>
CC0>
```

# Upgrading to a New Release with Minimal Downtime

The following steps present the basic sequence of tasks for upgrading a BNS-2000 Release 2.0 ECPU system with a dual Control Computer configuration to a new release with minimal downtime. For upgrades from Release 3.0, use "Upgrading to a New Software Build or Compatible Release" in a previous section.

The following steps also present the basic sequence of tasks for upgrading a *Datakit* II VCS Release 3.0, 3.1, and 4.0, or a BNS-1000 Release 1.1 and 2.0 Control Computer to *Datakit* II VCS Release 6.0 with an ECPU system with minimal downtime. For upgrades from *Datakit* II VCS Release 5.0, use "Upgrading to a New Software Build or Compatible Release" later in this section.

**NOTE:** These procedures can **ONLY** be used with a dual ECPU Control Computer configuration being upgraded to a Release 5.0 ECPU system. All other configurations must use the previous procedures for upgrading to a new release.

**TABLE 7-11. New Release Upgrade with Minimal Downtime Checklist**

| √ | Steps | Explanation |
|---|---|---|
| | 1. Planning the Upgrade | The equipment and software must be available, configuration decisions made, and a new software registration key obtained before upgrading can begin. |
| | 2. Preparing to Upgrade | The connection between the MRC and console must be checked and the auto backup and recovery options must be disabled. |
| | 3. Preserving the Database | The configuration database must be stored where it can be retrieved operationally, for normal operations or in case of difficulties. A report copy of the database should be generated. |

**TABLE 7-11. New Release Upgrade with Minimal Downtime Checklist** (continued)

| √ | Steps | Explanation |
|---|---|---|
| | 4. Upgrading CC1 Hardware and Software to a New Release<br>Retrieving the Database<br>Upgrading the Database<br>Rebooting the Node on CC1 | BNS-2000 Release 5.0 or *Datakit* II VCS Release 6.0 requires an ECPU controller and a disk hardware upgrade from earlier releases.<br>When upgrading a node with a dual ECPU system to BNS-2000 Release 5.0 or *Datakit* II VCS Release 6.0, the hardware and software upgrade are coordinated to minimize node downtime.<br>The database is retrieved from disk.<br>The database is upgraded to the new release's format.<br>When the node reboots, the hardware and software provides service using the new release. |
| | 5. Upgrading CC0 Hardware and Software to a New Release<br>Retrieving the Database<br>Rebooting the Node on CC0 | The CC0 disk(s) are upgraded and then the BNS-2000 software is copied from CC1. The CC1 hardware is upgraded and then the *Datakit* II VCS software is copied from CC1.<br>The upgraded database is retrieved from the CC1 disk.<br>When the node reboots, the hardware and software will provide service on the new release. |
| | 6. Verifying the Database Against the Original | In this optional step, the report copy of the database is compared to the results of new reports to ensure that all of the installed trunks and modules are equivalent to the original capability.<br>This step completes the upgrade process. |

## Step 1. Planning the Upgrade

The upgrade must be planned to ensure that all the equipment is available to complete the upgrade. The software and tapes must also be available, as well as sufficient staff and node outage time to perform the upgrade. Refer to the *Planning Guide* for additional information on upgrading. General information on equipment handling, tools, and preparation can be found in **Node Installation**.

The following table lists the equipment that must be available *before* you begin an upgrade.

**TABLE 7-12. Upgrade Equipment Checklist**

| √ | Equipment | Explanation |
|---|---|---|
| | *StarKeeper* II NMS, Release 9.0 | If the NMS is monitoring the node to be upgraded, make sure it is running Release 9.0. |
| | BNS-2000 software release tape (Release 5.0)<br>*Datakit* II VCS software release tape (Release 6.0) | |
| | Red Feature card for each feature package ordered | |
| | Formatted, blank tape | To back up the database once the upgrade is complete. |
| | New modules to be installed | See tables listing Control Computer Hardware and the procedures for your configuration under the step for Upgrading the Hardware. |
| | ESD wrist strap | properly grounded |
| | 3- and 12-inch flat blade screwdrivers | |
| | small/large Phillips-head screwdrivers | |
| | socket driver | |
| | 1/8" Nut Driver | Supplied with ECPU to CCM upgrade kit |
| | slot address labels for new modules | Check the label sheets supplied with your node cabinet. |

This method minimizes downtime during an upgrade because at least one Control Computer is active at all times. The following table gives an approximate time for each step and an indication of node outage, if applicable. Use this table for *planning* purposes only.

**TABLE 7-13. Timing the Upgrade with Minimal Downtime**

| Upgrading Step | Expected Time Intervals | |
|---|---|---|
| | Elapsed Time | Node Outage |
| 1. Planning the Upgrade | Dependent on configuration | none |
| 2. Preparing to Upgrade | Dependent on configuration | none |
| 3. Preserving the Database: | | |
| Saving to tape | 2 to 6 minutes | none |
| Uploading to *StarKeeper* II NMS | 2 to 5 minutes | none |
| Generating a database report | varies | none |
| 4. Upgrading the CC1 Hardware and Software | | |
| Upgrading the hardware | 5 to 10 minutes | none |
| Loading the BNS-2000 software | 90 minutes | none |
| Loading the *Datakit* II VCS software | 60 minutes | none |
| Retrieving and upgrading the database | 6 to 30 minutes | none |
| Registering the software | 2 to 5 minutes | none |
| Rebooting the node on CC1 | 4 to 20 minutes | yes |
| 5. Upgrading the CC0 Hardware and Software | | |
| Upgrading the hardware | 5 to 10 minutes | none |
| Copying the software | 15 to 20 minutes | none |
| Retrieving the database | 2 to 5 minutes | none |
| Rebooting the node on CC0 | 2 to 5 minutes | yes |
| 6. Verifying the Database Against the Original | varies | none |

### PROCEDURE 7-33. Obtaining the Software Registration Key

A software registration key is needed to make the node operational during the final steps of upgrading.

1. Check to make sure that the information needed to register your node is up-to-date; see Table 2 in the **Technical Assistance and Node Registration** preface.
2. This serial number or ID of the node, also called the **`Node Identifier,`** is required to obtain the software registration key that makes the node operational.

   At the **`CC0>`** prompt, enter **verify registration** or **dstat module** to obtain the serial number of the SCSI/DKI module (UN635B), which is usually in logical slot 78 for BNS-2000 nodes or in slot 14 for *Datakit* II VCS nodes.
3. Call 1-800-WE-2-CARE to obtain the software registration key before you start to upgrade. Write down the key in the space provided in Table 2 in the **Technical Assistance and Node Registration** preface.

The software registration key is needed during the final steps of upgrading.

## Step 2. Preparing to Upgrade

Before starting to upgrade, check the baud rate and the connection between the MRC and administration console, and disable the automatic database recovery and backup options.

---

### PROCEDURE 7-34. Disabling Automatic Recovery and Autobackup

**Application:** Node with MRC.

**Requirements:** The auto backup and recovery options must be disabled or problems will occur during the installation procedures and software upgrade.

1. To disable the automatic recovery feature, use the **set recovery off** command.

```
MRC> set recovery off
MRC>  Escape   Escape
CC0>
```

2. To disable the automatic database backup for dual disk systems: at the **`CC0>`** prompt, use the **change node** command to set auto backup to *off*.

### PROCEDURE 7-35. Checking the MRC–Console Connection

**Application:** Node with administration console port A connected to the MRC.

**Requirements:** The baud rate for port A must be set to 9600 bps before upgrading, or problems will occur during the installation procedures and software upgrade. The active Control Computer must be CC0.

1. These upgrade procedures assume that the administrative console used to perform the upgrade is connected to port A of the MRC. See the appropriate figures in the **Node Installation** chapter for the physical location of the Port A connector on the MRC (AWJ16B I/O board) if you are not sure that the console is connected to Port A.
2. If CC1 is the active Control Computer ( **CC1>** prompt) then at the MRC prompt use the **switchover** command to force CC0 as the active Control Computer.

```
CC1>  Escape  Escape
MRC> switchover
. . .
CC0>
```

3. At the **MRC>** prompt, use the **dstat** command to check the current baud rate for port A.

```
CC0>  Escape  Escape
MRC> dstat
. . .
MRC>
```

4. If the baud rate is not 9600, enter **set a baud 9600** to configure the port A terminal.

## Step 3. Preserving the Database

Before upgrading the hardware and software, the database files need to be stored off the node.

**WARNING:** For nodes with session maintenance trunks, be sure **no reroutes** are in effect before preserving the database. The upgrade will fail if you are backing up a database for a node containing rerouted session maintenance trunks; see the *Session Maintenance Guide*.

### PROCEDURE 7-36. Preserving the Database

**Requirements:** The required storage location is a data tape.

**Timing Note:** Backing up the database takes 2 to 6 minutes.

1. Enter the **sync** command to synchronize the database.
2. Back up the node configuration database to a blank, formatted 40MB tape; make sure the tape is write-enabled (the write-protect slide should be in the RECORD position).
   a. Insert the tape in tape drive 0; see the appropriate figure in **Chapter 3**.

      With the label facing you and the metal base facing to the right, push the tape against the hinged flap that covers the drive opening until it snaps into place.

      When the tape is properly seated, the red LED on the drive will light for about two minutes. During this time, the drive is initializing. Any attempt to access the tape before the initialization sequence completes will fail.

   b. When the red LED goes out, enter the **backup tape 0** command.
   c. Once the backup is complete, remove the tape from the drive, and label it.
3. Optionally, using the **backup host** command, upload a second copy of the database files to a *StarKeeper* II NMS host.

   For instructions on running the node software management tool (NDSWMGMT) to upload and download the database, see the *StarKeeper II NMS Core System Guide*.
4. Optionally, using **verify** commands, generate a database report that can be used to check the upgraded database at the conclusion of the release upgrade. See the procedure for Generating a Node Configuration Database Report.

## Step 4. Upgrading CC1 Hardware and Software to a New Release

In this step, the standby Control Computer's hardware and software are updated first, a switchover is executed so that the standby Control Computer becomes active, and the new software is registered. Step 5 continues the upgrade by updating the second Control Computer's hardware and software.

This step of the minimal downtime release upgrade involves the following procedures:

- Preparing the System Configuration for Upgrade
- Replacing Disk Hardware on Control Computer 1
- Installing New Software on Control Computer 1
- Retrieving and Upgrading the Database
- Rebooting the Node on Control Computer 1

---

### PROCEDURE 7-37. Preparing the System Configuration for Upgrade

**Requirements:** The port A baud rate should be 9600 bps. Automatic backup and automatic recovery must be set to *off*.

1. Verify that the controller mode switch of CC0 and CC1 is in the ENABL position.
2. At the **CC0>** prompt, enter **dstat cc** to verify the following:
   a. CC0 is active and the system is operating on the disk associated with CC0: disk 0.
   b. The standby Control Computer is in service and in standby mode.
3. Connect to Control Computer 1 (the standby Control Computer) using the **connect 1** command at the **MRC>** prompt.

```
CC0>  Escape  Escape
MRC> connect 1
SC1>
```

4. Move the switch on the SCSI/DKI in Control Computer 1 to DIAG.

**PROCEDURE 7-37. Preparing the System Configuration for Upgrade** (continued)

5. Bring Control Computer 1 down in preparation for loading the software.

```
SC1> stop
. . .
LOADER> monitor
. . .
MONITOR>
```

6. Return to the active Control Computer (CC0).

```
MONITOR> Escape Escape
MRC> connect 0
CC0>
```

7. Continue with the next procedure to upgrade disk hardware.

### PROCEDURE 7-38. Replacing Disk Hardware on Control Computer 1

**Application:** The new release requires a new disk drive. Use the following procedure to remove the existing disk module and install the new disk module.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules or I/O boards.

1. Remove the disk in Control Computer 1, as indicated in the following table.

| ECPU System to a New Release ECPU System Modules Removed | | | |
|---|---|---|---|
| **Product** | **Slot Number** | **Type** | **Module** |
| BNS-2000 Release 5.0 Shelf 5 | 91 | Disk | TN2175 |
| *Datakit* II VCS Release 6.0 | 27 | Disk | TN2175 |

2. Remove the three terminating resistors from the new disk drive, and save them.
3. Insert the new disk in the slot, as indicated in the following table.

| ECPU System to New Release ECPU System Modules Installed | | | |
|---|---|---|---|
| **Product** | **Slot Number** | **Type** | **Module** |
| BNS-2000 Release 5.0 Shelf 5 | 91 | Disk | TN2175B |
| *Datakit* II VCS Release 6.0 | 27 | Disk | TN2175B |

4. Verify that the module and I/O board are in the correct slot for your hardware configuration; see the figures that previously appeared.

5. Verify the installation by running the following firmware diagnostics.

```
CC0>  Escape  Escape
MRC> connect 1
. . .
MONITOR> di 0500
. . .
MONITOR>
```

6. Verify that all the diagnostics have **PASSED**. If any of the diagnostics fail, go to the appropriate procedures in the **Node Troubleshooting** chapter to run Monitor Mode Diagnostics to rerun specific diagnostics and to recover from Monitor Mode Diagnostic Failure to resolve problems.
7. When the diagnostics pass, reconnect to the active Control Computer, using the following command sequence.

```
MONITOR>  Escape  Escape
MRC> connect 0
CC0>
```

### PROCEDURE 7-39. Installing New Software on Control Computer 1

1. Insert the new release tape into tape drive 1.

   Make sure the tape is write-protected (the write-protect slide should *not* be in the RECORD position).

   When the red LED goes out, continue with the next step.

2. Use the following command sequence to load the software release to disk.

```
CC0> utilsh
UTILITY> diskcopy -e
> tp/b1t3p4 rdsk/b1t0pf 8
. . .
> tp/b1t3p1 rdsks0
. . .
>  Control  -  D
UTILITY> exit
CC0>
```

**NOTE:** The first **diskcopy** command takes about one minute.

The second **diskcopy** command copies the release into the primary partition and executes for 40 to 60 minutes.

Both commands read from tape drive 1 and write to disk 1.

### PROCEDURE 7-40. Retrieving and Upgrading the Database

**Timing note:** This procedure takes from 6 to 30 minutes, depending on the size of the database.

1 Use the **backup standby** command to put the current database in the backup area of disk 1 in preparation for the database upgrade.

```
CC0> backup standby
```

2 Use the MRC **connect 1** command to connect to the standby Control Computer.

```
CC0>  Escape  Escape
MRCM> connect 1
MONITOR>
```

3A *For the BNS-2000 ECPU system only:*

Set up the Release 5.0 file system by entering the following command sequence. The command entered at the **LOADER>** prompt allows the file system to be created on the standby Control Computer while Control Computer 0 (CC0) is fully operational.

**NOTE:** This step will take about 30 minutes to complete and will bring the Control Computer back down to the UTILITY prompt when it is finished.

```
MONITOR> boot p/0
LOADER> run p/0:dkc3
. . .
<DBG> :c
. . .
<STARTUP> $ sh
INFO:  This file system contains compressed files.
       Run setuprel to set up the release before rebooting.
Entering the stand-alone shell
MINI-SH:  What can I do for you?
UTILITY> setuprel
. . .
The release is ready to run.  Enter the reboot command.
UTILITY>
```

**PROCEDURE 7-40. Retrieving and Upgrading the Database** (continued)

3B. *For the Datakit II VCS ECPU system only:*

Use the following command sequence to upgrade the database. The command entered at the **LOADER>** prompt allows the upgrade to be executed on the standby Control Computer while Control Computer 0 (CC0) is fully operational.

**NOTE:** The **dbupgrd** command will take 6 to 30 minutes to complete depending on the size of the database.

```
MONITOR> boot p/0
. . .
LOADER> run p/0:dkc3
. . .
<DBG> :c
. . .
<STARTUP> $ sh
UTILITY> dbupgrd
. . .
UTILITY>
```

**WARNING:** If **dbupgrd** fails, **DO NOT PROCEED** because it may not be possible to recover the node configuration database. For assistance, call 1-800-WE-2-CARE (in the U.S.).

When the **UTILITY>** prompt returns, the command has executed successfully and you can continue with the next step.

4 To create the standby file system, use the **copystby** command.

**NOTE:** The **copystby** command takes approximately 5 minutes to execute.

```
UTILITY> copystby
. . .
UTILITY>
```

### PROCEDURE 7-41. Rebooting the Node on Control Computer 1

1. Move the controller mode switch in Control Computer 1 to ENABL and reboot.

```
UTILITY> reboot
Are you sure? yes
. . .
SC1>
```

2. Move the controller mode switch in Control Computer 0 to DIAG so that it does not boot during the switchover.
3. Use the MRC **switchover** command to make Control Computer 1 the active Control Computer.

```
SC1>  Escape  Escape
MRC> switchover
. . .
CC1>
```

**NOTE:** This is the only time during this procedure that existing calls are taken down. During the switchover, all the modules will receive a download of the new software. This can take anywhere from 2 to 20 minutes depending on the number of downloadable modules configured.

4. Use the **install registration** procedure in the **Node Operations** chapter to register the release software for Control Computer 1 (CC1).
5. Check the time using the **display time** command. If necessary, use the **set time** command to reset the time for Control Computer 1 (CC1), as follows.

```
CC1> set time
TIME[HHMMSS] +(211109):
DATE[YYMMDD] +(960130):
CC1>
```

**PROCEDURE 7-41. Rebooting the Node on Control Computer 1** (continued)

6. Enter **verify node** to verify that the new release and build are active on the node.

*At this point, disk 1 is completely updated, Control Computer 1 is in active mode, and Control Computer 0 is waiting at the* **`MONITOR>`** *prompt.*

**NOTE:** Before continuing with the step for Verifying the Database Against the Original, wait until all the modules have received a new download and are restored to service.

## Step 5. Upgrading CC0 Hardware and Software to a New Release

After upgrading Control Computer 1 (CC1), continue with upgrading the disk of Control Computer 0 (CC0) and the software on disk 0. This step of the minimal downtime release upgrade involves the following procedures:

- Replacing Disk Hardware on Control Computer 0: ECPU System
- Installing New Software on Control Computer 0
- Retrieving the Database
- Rebooting the Node on Control Computer 0

---

### PROCEDURE 7-42. Replacing Disk Hardware on Control Computer 0: ECPU System

The existing disk drive in CC0 must now be removed and the new disk installed.

**CAUTION:** Wear a properly grounded ESD wrist strap while handling modules or I/O boards.

1. Remove the disk in Control Computer 0 as indicated in the following table.

| ECPU System to New Release ECPU System Modules Removed | | | |
|---|---|---|---|
| **Product** | **Slot Number** | **Type** | **Module** |
| BNS-2000 Release 5.0 Shelf 4 | 75 | Disk | TN2175 |
| *Datakit* II VCS Release 6.0 | 11 | Disk | TN2175 |

2. Remove the three terminating resistors from the new disk drive and save them.

3. Insert the new disk in the slot, as indicated in the following table.

| ECPU System to New Release ECPU System Modules Installed | | | |
|---|---|---|---|
| **Product** | **Slot Number** | **Type** | **Module** |
| BNS-2000 Release 5.0 Shelf 4 | 75 | Disk | TN2175B |
| *Datakit* II VCS Release 6.0 | 11 | Disk | TN2175B |

3. Verify that the module and I/O board are in the correct slot for your hardware configuration; see the figures that were previously provided.
4. Verify the installation by running the following firmware diagnostics.

```
CC1>  Escape  Escape
MRC> connect 0
WARNING: CC0 is failed or non-existent
MONITOR> di 0500
. . .
MONITOR>
```

5. Verify that the diagnostics have **PASSED**. If any of the diagnostics fail, go to the appropriate procedures in the **Node Troubleshooting** chapter to run Monitor Mode Diagnostics to rerun specific diagnostics and to recover from Monitor Mode Diagnostic Failure to resolve problems.
6. When the diagnostics pass, reconnect to the active Control Computer, using the following command sequence.

```
MONITOR>  Escape  Escape
MRC> connect 1
CC1>
```

**NOTE:** Before continuing, wait until all the modules have received a new download and are restored to service.

### PROCEDURE 7-43. Installing New Software on Control Computer 0

1. Use the following sequence of commands to update disk 0.

```
CC1> utilsh
UTILITY> dupdisk
. . .
UTILITY> exit
CC1>
```

**NOTE:** The **dupdisk** command takes about 15 minutes. The file systems are checked after they are copied and messages are printed indicating the adjustments being made because the primary file system was active during the copy.

### PROCEDURE 7-44. Backing Up the Database

1. Use the **backup** command to put the current database in the backup area of disk 0 and the save area of disk 1.

```
CC1> backup standby
. . .
CC1> backup save 1
. . .
CC1>
```

2. Once the database is backed up, continue with the next procedure to reboot the node.

### PROCEDURE 7-45. Rebooting the Node on Control Computer 0

1. Move the controller mode switch in Control Computer 0 (CC0) to ENABL in preparation for the switchover.
2. Use the MRC **switchover** command to make Control Computer 0 (CC0) the active Control Computer. A warning prompt may appear if CC0 is still waiting at the **MONITOR>** prompt; type **y** for *yes* to continue.

```
CC1> stop
. . .
LOADER> Escape Escape
MRC> switchover

WARNING: Standby control computer 0 is failed.  Continue
switchover (y/n): y
. . .
CC0>
```

3. Use the **change node** command to set auto backup to *on*.
4. Update the database backup on disk 0 to preserve the node registration.

```
CC0> sync
CC0> backup save 0
. . .
CC0>
```

5. Check the time using the **display time** command. If necessary, use the **set time** command to reset the time for Control Computer 0 (CC0), as follows.

```
CC0> set time
TIME[HHMMSS] +(211109):
DATE[YYMMDD] +(960130):
CC0>
```

**PROCEDURE 7-45. Rebooting the Node on Control Computer 0** (continued)

6. To set automatic recovery to *on*, use the following command sequence.

```
CC0>  Escape  Escape
MRC> set recovery on
MRC> connect active
CC0>
```

7. Use the **verify node** command to verify that the new release and build are active on the node.
8. Remove the release tape from the tape drive and store it.

*This completes the upgrade of the software to a new release with minimal downtime.*

**NOTE:** If using *StarKeeper* II NMS, be sure to perform the necessary operations for updating the node information on *StarKeeper*. See the *StarKeeper II NMS Core System Guide*.

## Step 6. Verifying the Database Against the Original

Optionally, generate a database report using the procedure for Generating a Node Configuration Database Report and compare it to the database report obtained prior to the database upgrade. Correct any differences using administrative commands; see Verifying the Database in **Node Administration**.

# Appendix.
# Node Database Entry Forms

This appendix contains forms to photocopy and use when initially configuring the database or when making any extensive changes. Entry forms for the interface modules placed in the node shelves or MPCs are in the appendix of each hardware module reference guide.

Collect the appropriate entry forms, along with the database design forms from the *Planning Guide,* and assemble them in the order that components and services will be configured.

Refer to the *Planning Guide* and to the *Commands Reference* for more information to help complete these forms.

Each form lists the prompts that appear when the **enter** command is used and the range of values that can be entered in response. Default values are shown in *italics*.


| Form | Title | Page |
|---|---|---|
| **A-1.** | Entering a Node | **A-3** |
| **A-2.** | Entering a Series M2 Extension Shelf (BNS-2000 Nodes Only) | **A-10** |
| **A-3.** | Entering a Series M1 Port Shelf (BNS-2000 Nodes Only) | **A-10** |
| **A-4.** | Entering a Receiving Group | **A-11** |
| **A-5.** | Entering a Local Originating or Two-way Group | **A-11** |
| **A-6.** | Entering a Trunk Group | **A-11** |
| **A-7.** | Entering a Profile for Billing | **A-12** |
| **A-8.** | Entering a Profile for CPM or Trunk Call Screening | **A-13** |
| **A-9.** | Entering a Profile for a Closed User Group Assigned to a Gateway | **A-14** |
| **A-10.** | Entering a Profile to Map a Closed User Group for a National or International X.75 Gateway | **A-14** |
| **A-11.** | Entering a Profile for a Closed User Group Not Assigned to a Gateway | **A-15** |
| **A-12.** | Entering a Profile to Check Traffic from an International X.75 Gateway | **A-16** |
| **A-13.** | Entering an X.3 Profile | **A-17** |
| **A-14.** | Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only) | **A-20** |
| **A-15.** | Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only) | **A-28** |
| **A-16.** | Entering a Stratum 4 Clock (SSM4) (BNS-2000 Nodes Only) | **A-41** |
| **A-17.** | Entering a Stratum 4 Clock (STR4) (BNS-2000 Nodes Only) | **A-42** |
| **A-18.** | Entering an X.28 Signal for PAD Service | **A-43** |

| | | |
|---|---|---|
| **A-19.** | Entering a Gateway for an X.25 Port | **A-44** |
| **A-20.** | Entering a Network (DNIC), Area (SR), Exchange (SA), or Station (EPN) Address | **A-45** |
| **A-21.** | Entering a Speedcall Address | **A-47** |
| **A-22.** | Entering an X.25 Host or PDN Address | **A-48** |
| **A-23.** | Entering a Group Address Resolver (GAR) Module (BNS-2000 Nodes Only) | **A-49** |
| **A-24.** | Entering a DKAP Module | **A-50** |
| **A-25.** | Entering a DKAP Channel Set for Host, Terminal, or Two-way Service | **A-51** |

## FORM A-1. Entering a Node

| | | |
|---|---|---|
| **LOCAL NETWORK MNEMONIC ADDRESS**<br>[up to 8 chars, *none*] | | |
| **LOCAL X.121 DNIC**<br>[0000–9999, *none*] | | |
| If LOCAL NETWORK MNEMONIC ADDRESS or LOCAL X.121 DNIC is entered:<br>**DIRECTORY ENTRY**<br>[up to 30 chars double quoted, *none*] | | |
| **LOCAL AREA MNEMONIC ADDRESS**<br>[up to 8 chars, *none*] | | |
| **LOCAL X.121 SERVICE REGION**<br>[000–999, *none*] | | |
| If LOCAL AREA MNEMONIC ADDRESS or LOCAL X.121 SERVICE REGION is entered:<br>**DIRECTORY ENTRY**<br>[up to 30 chars double quoted, *none*] | | |
| **LOCAL EXCHANGE MNEMONIC ADDRESS**<br>[up to 8 chars, *none*] | | |
| **LOCAL X.121 SERVICE AREA**<br>[000–999, *none*] | | |
| If LOCAL EXCHANGE MNEMONIC ADDRESS or LOCAL X.121 SERVICE AREA is entered:<br>**DIRECTORY ENTRY**<br>[up to 30 chars double quoted, *none*] | | |
| **LOCAL NODE NAME**<br>[up to 8 chars, *none*] | | |
| **LOCAL NODE PREFIX**<br>[0–9, *none*] | | |
| **NATIONAL COUNTRY CODE**<br>[1-999, *1*] | | |
| **INTERNATIONAL PREFIX**<br>[0–9, *0*] | | |
| **LINE 1 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |

**FORM A-1. Entering a Node** (continued)

| | | |
|---|---|---|
| If LINE 1 of BROADCAST MSG was entered:<br>**LINE 2 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| If LINE 2 of BROADCAST MSG was entered:<br>**LINE 3 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| If LINE 3 of BROADCAST MSG was entered:<br>**LINE 4 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| If LINE 4 of BROADCAST MSG was entered:<br>**LINE 5 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| If LINE 5 of BROADCAST MSG was entered:<br>**LINE 6 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| If LINE 6 of BROADCAST MSG was entered:<br>**LINE 7 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| If LINE 7 of BROADCAST MSG was entered:<br>**LINE 8 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |

**FORM A-1. Entering a Node** (continued)

| | | |
|---|---|---|
| If LINE 8 of BROADCAST MSG was entered:<br>**LINE 9 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| If LINE 9 of BROADCAST MSG was entered:<br>**LINE 10 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| If LINE 10 of BROADCAST MSG was entered:<br>**LINE 11 OF BROADCAST MSG**<br>[up to 72 chars double quoted, *none*] | | |
| For an ECPU node:<br>**CONTROL COMPUTER 0 ADDRESS**<br>[30, 46, 62, *78*, 94, 110, 126]<br>for BNS-2000 nodes<br>[*14*, 30, 46, 62, 78, 94, 110, 126]<br>for BNS-2000 VCS nodes | | |

**FORM A-1. Entering a Node** (continued)

| | | |
|---|---|---|
| For a CCM node:<br>**CONTROL COMPUTER 0 ADDRESS**<br>[29, 30, 45, 46, 61, 62, 77, *78*, 93, 94, 109, 110, 125, 126]<br>for BNS-2000 nodes<br><br>[13, *14*, 29, 30, 45, 46, 61, 62, 77, 78, 93, 94, 109, 110, 125, 126]<br>for BNS-2000 VCS nodes | | |
| **CONTROL COMPUTER 1 ADDRESS**<br>[x, y, *none*] | | |
| If CONTROL COMPUTER 0 ADDRESS is specified and if CONTROL COMPUTER 1 ADDRESS is *none*:<br>**MRC**<br>[yes, *no*] | | |
| If CONTROL COMPUTER 0 ADDRESS is specified and if CONTROL COMPUTER 1 ADDRESS is *none* and this is an ECPU node:<br>**DUAL DISK DRIVES**<br>[yes, *no*] | | |

**FORM A-1. Entering a Node** (continued)

| | | |
|---|---|---|
| If CONTROL COMPUTER 1 ADDRESS is not *none* or DUAL DISK DRIVES is *yes:*<br>**AUTOMATIC BACKUP**<br>[*on*, off] | | |
| **REDUNDANT SWITCH**<br>[yes, *no*] | | |
| **NODE MONITORED BY STARKEEPER NMS**<br>[*yes*, no] | | |
| **PORT A USED FOR**<br>[console, printer, *both* (console and printer), nothing] | | |
| If PORT A USED FOR does not equal *nothing*:<br>**PORT A CONNECTED TO ALARM ACTIVATOR**<br>[yes, *no*] | | |
| **PORT A BAUD RATE**<br>[75, 110, 300, 1200, 1800, 2400, 4800, *9600*, 19200] | | |
| If the controller mode switch is set to DIAG:<br>**PORT A PASSWORD**<br>[6 to 8 chars, *none*] | | |
| If password is entered for Port A:<br>**PORT A EXPIRATION INTERVAL (DAYS)**<br>[1–365, *none*] | | |
| If PORT A USED FOR is *nothing* or *printer*:<br>**PORT B USED FOR**<br>[console, printer, both (console and printer), *nothing*] | | |

**FORM A-1. Entering a Node** (continued)

| | | |
|---|---|---|
| If PORT B USED FOR does not equal *nothing*:<br>**PORT B CONNECTED TO ALARM ACTIVATOR**<br>[yes, *no*] | | |
| **PORT B BAUD RATE**<br>[75, 110, 300, *1200*, 1800, 2400, 4800, 9600, 19200] | | |
| If the controller mode switch is set to DIAG:<br>**PORT B PASSWORD**<br>[6 to 8 chars, *none*] | | |
| If password is entered for PORT B:<br>**PORT B EXPIRATION INTERVAL**<br>[1-365, *none*] | | |
| **ACTIVATE BABBLING SIGNAL FEATURE**<br>[*yes*, no] | | |
| If ACTIVATE BABBLING SIGNAL FEATURE is *yes:*<br>**AUTOMATICALLY REMOVE BABBLING PORTS FROM SERVICE**<br>[*yes*, no] | | |
| **AUTOMATICALLY REMOVE TRUNKS WITH ERRORS**<br>[yes, *no*] | | |
| If AUTOMATICALLY REMOVE TRUNKS WITH ERRORS is *yes:*<br>**AFTER HOW MANY ERROR PACKETS (PER TWO MINUTES)**<br>[2–59, *50*] | | |
| **ACTIVATE EXTENDED ROUTING FEATURE**<br>[yes, *no*] | | |

**FORM A-1. Entering a Node** (continued)

| | | |
|---|---|---|
| **MAXIMUM HOP COUNT PER CALL**<br>[3–99, *none*] | | |
| **MAXIMUM CLNS HOP COUNT**<br>[3–99, *none*] | | |
| **SET SMALL WINDOW SIZE**<br>[yes, *no*] | | |
| ***FINE TUNE SESSION MAINTENANCE PARAMETERS**<br>[yes, *no*] | no | no |

* A *no* response is required because session maintenance is administered through *StarKeeper* II NMS. Consult the *Data Networking Products Session Maintenance Guide* and the *StarKeeper II NMS Graphics Systems Guide*.

## FORM A-2. Entering a Series M2 Extension Shelf (BNS-2000 Nodes Only)

| | | |
|---|---|---|
| **SHELF TYPE**<br>[extension, port] | | |
| If SHELF TYPE is *extension*:<br>**SHELF NUMBER**<br>[1–3] | | |
| **COMMENT**<br>[up to 60 chars double-quoted, *none*] | | |

## FORM A-3. Entering a Series M1 Port Shelf (BNS-2000 Nodes Only)

| | | |
|---|---|---|
| **SHELF TYPE**<br>[extension, port] | | |
| **SHELF NUMBER**<br>[1–7] | | |
| If SHELF TYPE is *port* and one or more SHELF TYPEs are *extension*:<br>**SHELF NUMBER**<br>[4–7] | | |
| **ENABLE LINK MEASUREMENTS FOR THIS SHELF**<br>[yes, *no*] | | |
| **COMMENT**<br>[up to 60 chars double-quoted, *none*] | | |

### FORM A-4. Entering a Receiving Group

| | | |
|---|---|---|
| **GROUP**<br>[up to 8 chars] | | |
| **TYPE**<br>[*local*, trunk] | local | local |
| **DIRECTION**<br>[originate, receive, 2way] | receive | receive |
| **DEVICE OR HOST**<br>[up to 8 chars, *standard*] | | |
| **HOST/AUTOBAUD**<br>[on, *off*] | | |
| **ROUND ROBIN SERVICE**<br>[per_port, per_module, *none*] | | |

### FORM A-5. Entering a Local Originating or Two-way Group

| | | |
|---|---|---|
| **GROUP**<br>[up to 8 chars] | | |
| **TYPE**<br>[*local*, trunk] | local | local |
| **DIRECTION**<br>[originate, receive, 2way] | originate__<br>2way__ | originate__<br>2way__ |
| **DEVICE OR HOST**<br>[up to 8 chars, *standard*] | | |
| **PASSWORD**<br>[up to 8 chars, *none*] | | |
| If PASSWORD is not *none:*<br>**PASSWORD REQ'D DURING**<br>[*select*, network_access, both] | | |
| If DIRECTION is *2way:*<br>**ROUND ROBIN SERVICE**<br>[per_port, per_module, *none*] | | |

### FORM A-6. Entering a Trunk Group

| | | |
|---|---|---|
| **GROUP**<br>[up to 8 chars] | | |
| **TYPE**<br>[*local*, trunk] | trunk | trunk |
| **ROUND ROBIN SERVICE**<br>[per_module, *none*] | | |

## FORM A-7. Entering a Profile for Billing

| | | |
|---|---|---|
| **TYPE**<br>[billing, call_screening, cmap, cug, traf_chk, x3] | billing | billing |
| **PROFILE ID**<br>[up to 8 chars] | | |
| **BILLING SEGMENT SIZE**<br>[16, *64*, 128] | | |
| **BILLING SEGMENT THRESHOLD**<br>[64-65535, *32767*] | | |
| **RESET PACKET THRESHOLD**<br>[1-65535, *127*] | | |
| **INTERRUPT PACKET THRESHOLD**<br>[1-65535, *127*] | | |
| **PVCs BILLING TIMERS THRESHOLD**<br>[30-1440, *60*] | | |
| **SVCs BILING TIMERS**<br>[on, *off*] | | |

## FORM A-8. Entering a Profile for CPM or Trunk Call Screening

| | | |
|---|---|---|
| **TYPE**<br>[billing, call_screening, cmap, cug, traf_chk, x.3] | call_screening | call_screening |
| **PROFILE ID**<br>[up to 8 chars] | | |
| **1. SECURITY PATTERN**<br>[up to 67 chars] | | |
| **2. SECURITY PATTERN**<br>[up to 67 chars] | | |
| **3. SECURITY PATTERN**<br>[up to 67 chars] | | |

### FORM A-9. Entering a Profile for a Closed User Group Assigned to a Gateway

| | | |
|---|---|---|
| **TYPE**<br>[billing, call_screening, cmap, cug, traf_chk, x3] | cug | cug |
| **PROFILE ID**<br>[up to 8 chars] | | |
| **GATEWAY CLOSED USER GROUP PROFILE**<br>[yes, *no*] | | |
| **CLOSED USER GROUP INDEX**<br>[*1*-99] | | |
| **CLOSED USER GROUP**<br>[1-255] | | |
| **INCOMING ACCESS PERMISSION**<br>[on, *off*] | | |
| **OUTGOING ACCESS PERMISSION**<br>[on, *off*] | | |
| **PREFERENTIAL CLOSED USER GROUP INDEX**<br>[*1*-99] | | |

### FORM A-10. Entering a Profile to Map a Closed User Group for a National or International X.75 Gateway

| | | |
|---|---|---|
| **TYPE**<br>[billing, call_screening, cmap, cug, traf_chk, x3] | cmap | cmap |
| **PROFILE ID**<br>[up to 8 chars] | | |
| **CLOSED USER GROUP**<br>[1-255] | | |

## FORM A-11. Entering a Profile for a Closed User Group Not Assigned to a Gateway

| | | |
|---|---|---|
| **TYPE**<br>[billing, call_screening, cmap, cug, traf_chk, x3] | cug | cug |
| **PROFILE ID**<br>[up to 8 chars] | | |
| **GATEWAY CLOSED USER GROUP PROFILE**<br>[yes, *no*] | | |
| **CLOSED USER GROUP INDEX**<br>[1-20, *1*] | | |
| **CLOSED USER GROUP**<br>[1-255] | | |
| **INCOMING ACCESS PERMISSION**<br>[on, *off*] | | |
| **OUTGOING ACCESS PERMISSION**<br>[on, *off*] | | |
| **PREFERENTIAL USER GROUP INDEX**<br>[1-20, *1*] | | |

## FORM A-12. Entering a Profile to Check Traffic from an International X.75 Gateway

| | | |
|---|---|---|
| **TYPE**<br>[billing, call_screening, cmap, cug, traf_chk, x3] | traf_chk | traf_chk |
| **PROFILE ID**<br>[up to 8 chars] | | |
| **1.DNIC PATTERN**<br>[up to 21 chars] | | |
| **2.DNIC PATTERN**<br>[up to 21 chars] | | |
| **3.DNIC PATTERN**<br>[up to 21 chars] | | |
| **1.CC PATTERN**<br>[up to 21 chars] | | |
| **2.CC PATTERN**<br>[up to 21 chars] | | |
| **3.CC PATTERN**<br>[up to 21 chars] | | |

## FORM A-13. Entering an X.3 Profile

| | | |
|---|---|---|
| **TYPE**<br>[billing, call_screening, cmap, cug, traf_chk, x3] | x3 | x3 |
| **PROFILE ID**<br>[up to 20 chars] | | |
| **PAD RECALL CHARACTER**<br>[single char, *dle*, none] | | |
| **ECHO**<br>[*yes*, no] | | |
| **DATA FORWARDING SIGNAL**<br>[0-127, *126*] | | |
| **IDLE TIMER DELAY**<br>[*notimer*, mintimer, .1, 1, 12.75 seconds] | | |
| **FLOW CONTROL BY NETWORK (XON/XOFF)**<br>[*no*, data, comm&data] | | |
| **PAD SERVICE SIGNAL CONTROL**<br>[none, pad, *prompt&pad*] | | |
| **PAD OPERATION ON RECEIPT OF BREAK**<br>[0-31, *2*] | | |
| **DISCARD OUTPUT**<br>[yes, *no*] | | |
| **PADDING AFTER CARRIAGE RETURN**<br>[*0*-12] | | |
| **LINE FOLDING**<br>[*0*-255] | | |
| **BINARY SPEED**<br>[75, 110, 150, 300, 1200, 1800, 2400, 4800, *9600*, 19200] | | |
| **FLOW CONTROL BY DEVICE (XON/XOFF)**<br>[*yes*, no] | | |
| **LINEFEED INSERTION AFTER CARRIAGE RETURN**<br>[*0*-2, 4-7] | | |
| **LINEFEED PADDING**<br>[*0*-7] | | |

**FORM A-13. Entering an X.3 Profile** (continued)

| | | |
|---|---|---|
| **EDITING**<br>[yes, *no*] | | |
| **CHARACTER DELETE**<br>[single char, del, sp, *^H*] | | |
| **LINE DELETE**<br>[single char, del, sp, *@]* | | |
| **LINE DISPLAY**<br>[single char, del, sp, *^L*] | | |
| If PAD SERVICE SIGNAL CONTROL is *pad* or *prompt&pad*:<br>**EDITING PAD SERVICE SIGNAL**<br>[*no*, print, display, single char] | | |
| If ECHO is *yes:*<br>**ECHO ALL CHARACTERS**<br>[*yes*, no] | | |
| If ECHO ALL CHARACTERS is *no*:<br>**ECHO CR**<br>[*yes*, no] | | |
| If ECHO ALL CHARACTERS is *no*:<br>**ECHO LF**<br>[*yes*, no] | | |
| If ECHO ALL CHARACTERS is *no*:<br>**ECHO VT, HT, FF**<br>[*yes*, no] | | |
| If ECHO ALL CHARACTERS is *no*:<br>**ECHO BEL, BS**<br>[*yes*, no] | | |
| If ECHO ALL CHARACTERS is *no*:<br>**ECHO ESC, ENQ**<br>[*yes*, no] | | |
| If ECHO ALL CHARACTERS is *no*:<br>**ECHO ACK, NAK, STX, SOH, EOT, ETB, ETX**<br>[*yes*, no] | | |
| If ECHO ALL CHARACTERS is *no*:<br>**ECHO OF EDITING CHAR**<br>[*yes*, no] | | |
| If ECHO ALL CHARACTERS is *no*:<br>**ECHO DEL AND ALL OTHER CHARACTERS NOT MENTIONED ABOVE**<br>[*yes*, no] | | |

**FORM A-13. Entering an X.3 Profile** (continued)

| | | |
|---|---|---|
| **PARITY TREATMENT**<br>[check, gen, gen&check, *no*] | | |
| **PAGE WAIT**<br>[yes, *no*] | | |
| If PAGE WAIT is *yes:*<br>**NUMBER OF LINEFEED CHARACTERS**<br>[1-255, *23*] | | |

## FORM A-14. Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only)

| | | |
|---|---|---|
| **THRESHOLD PROFILE ID**<br>[1–16] | | |
| **TYPE OF PROFILE**<br>[e1, e3, t1, t3] | e1 or t1 | e1 or t1 |
| **TUNE <E1/T1> 15 MINUTE INTERVAL PARAMETERS**<br>[yes, *no*] | | |
| If TUNE <E1/T1> 15 MINUTE INTERVAL PARAMETERS is *yes:*<br>**TUNE LAYER PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TYPE OF PROFILE IS *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**LINE CODE VIOLATION**<br>[1–4194303, *14*] | | |
| If TYPE OF PROFILE IS *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**LINE ERRORED SECONDS FOR RECEIVE**<br>[1–900, *12*] | | |
| If TYPE OF PROFILE IS *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**LINE ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *12*] | | |
| If TYPE OF PROFILE IS *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**LINE SEVERELY ERRORED SECONDS**<br>[1–900, *10*] | | |

**FORM A-14. Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**CODE VIOLATION FOR RECEIVE**<br>[1–4194303, *14*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**CODE VIOLATION FOR TRANSMIT**<br>[1–4194303, *14*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED SECONDS FOR RECEIVE**<br>[1–900, *12*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *12*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR RECEIVE**<br>[1–900, *10*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *10*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED FRAMING SECONDS FOR RECEIVE**<br>[1–900, *2*] | | |

**FORM A-14. Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TYPE OF PROFILE IS *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED FRAMING SECONDS FOR TRANSMIT**<br>[1–900, *2*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ALARM INDICATION SIGNAL SECONDS**<br>[1–900, *2*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**UNAVAILABLE SECONDS**<br>[1–900, *10*] | | |
| If TUNE <E1/T1> 15 MINUTE INTERVAL PARAMETERS is *yes:*<br>**TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**CODE VIOLATION FOR RECEIVE**<br>[1–4194303, *13*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**CODE VIOLATION FOR TRANSMIT**<br>[1–4194303, *13*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED SECONDS FOR RECEIVE**<br>[1–900, *12*] | | |

**FORM A-14. Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *12*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR RECEIVE**<br>[1–900, *10*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *10*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED FRAMING SECONDS**<br>[1–900, *2*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**UNAVAILABLE SECONDS**<br>[1–900, *10*] | | |
| **TUNE SUM OF ERRORS ALGORITHM THRESHOLDS**<br>[yes, *no*] | | |
| If TUNE SUM OF ERRORS ALGORITHM is *yes:*<br>**LEVEL 2 THRESHOLD**<br>[1–4194303, *100*] | | |
| If TUNE SUM OF ERRORS ALGORITHM is *yes:*<br>**LEVEL 3 THRESHOLD**<br>[1–4194303, *20*] | | |
| **TUNE BURSTY ERROR ALGORITHM LEVEL 3 THRESHOLDS**<br>[yes, *no*] | | |

**FORM A-14. Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE BURSTY ERROR ALGORITHM LEVEL 3 THRESHOLDS is *yes:*<br>**NUMBER OF RECEIVED PDUs**<br>[1–3000000, *3300*] | | |
| If TUNE BURSTY ERROR ALGORITHM LEVEL 3 THRESHOLDS is *yes:*<br>**MINIMUM NUMBER OF ERRORED PDUs**<br>[1–3000000, *100*] | | |
| If TUNE BURSTY ERROR ALGORITHM LEVEL 3 THRESHOLDS is *yes:*<br>**RATIO THRESHOLD VALUE**<br>[1–100, *4*] | | |
| **TUNE <E1/T1> 24 HOUR INTERVAL PARAMETERS**<br>[yes, *no*] | | |
| If TUNE <E1/T1> 24 HOUR INTERVAL PARAMETERS is *yes:*<br>**TUNE LAYER PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TYPE OF PROFILE is *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**LINE CODE VIOLATION**<br>[1–4194303, *134*] | | |
| If TYPE OF PROFILE is *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**LINE ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *121*] | | |
| If TYPE OF PROFILE is *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**LINE ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *121*] | | |

**FORM A-14. Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TYPE OF PROFILE is *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**LINE SEVERELY ERRORED SECONDS**<br>[1–86400, *100*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**CODE VIOLATION FOR RECEIVE**<br>[1–4194303, *134*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**CODE VIOLATION FOR TRANSMIT**<br>[1–4194303, *134*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *121*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *121*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *100*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *100*] | | |

**FORM A-14. Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED FRAMING SECONDS FOR RECEIVE**<br>[1–86400, *17*] | | |
| If TYPE OF PROFILE is *t1* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED FRAMING SECONDS FOR TRANSMIT**<br>[1–86400, *17*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ALARM INDICATION SIGNAL SECONDS**<br>[1–900, *2*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**UNAVAILABLE SECONDS**<br>[1–86400, *10*] | | |
| If TUNE <E1/T1> 24 HOUR INTERVAL PARAMETERS is *yes:*<br>**TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**CODE VIOLATION FOR RECEIVE**<br>[1–4194303, *125*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**CODE VIOLATION FOR TRANSMIT**<br>[1–4194303, *125*] | | |

**FORM A-14. Entering an E1 or T1 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *121*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *121*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *100*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *100*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED FRAMING SECONDS**<br>[1–86400, *17*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**UNAVAILABLE SECONDS**<br>[1–86400, *10*] | | |

## FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)

| | | |
|---|---|---|
| **THRESHOLD PROFILE ID**<br>[1–16] | | |
| **TYPE OF PROFILE**<br>[e1, e3, t1, t3] | e3 or t3 | e3 or t3 |
| **MODULE TYPE**<br>[ai, trunk] | | |
| If TYPE OF PROFILE is *e3* and MODULE TYPE is *trunk*:<br>**TRUNK TYPE**<br>[e3, e3a, e3s] | | |
| If TYPE OF PROFILE is *t3* and MODULE TYPE is *trunk*:<br>**TRUNK TYPE**<br>[t3, t3a, t3i, t3s] | | |
| **TUNE <E3/T3> 15 MINUTE INTERVAL PARAMETERS**<br>[yes, *no*] | | |
| If TUNE <E3/T3> 15 MINUTE INTERVAL PARAMETERS is *yes:*<br>**TUNE LAYER PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**LINE CODE VIOLATION***<br>[1–4194303, *387*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**LINE ERRORED SECONDS***<br>[1–900, *86*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**LINE SEVERELY ERRORED SECONDS***<br>[1–900, *4*] | | |

* This parameter is not applicable for AI-E3, Trunk-E3, or Trunk-E3S.

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes*:<br>**CODE VIOLATION FOR RECEIVE**<br>[1–4194303, *382*] | | |
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes*:<br>**CODE VIOLATION FOR TRANSMIT**<br>[1–4194303, *382*] | | |
| If TRUNK TYPE is *t3a* or *e3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED SECONDS FOR RECEIVE**<br>[1–900, *86*] | | |
| If TRUNK TYPE is *t3a* or *e3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *86*] | | |
| If TRUNK TYPE is *t3a* or *e3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR RECEIVE**<br>[1–900, *4*] | | |
| If TRUNK TYPE is *t3a* or *e3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *4*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is not *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**P-BIT PARITY CODE VIOLATION***<br>[1–4194303, *382*] | | |
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is not *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED SECONDS**<br>[1–900, *86*] | | |
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is not *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS**<br>[1–900, *4*] | | |
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is not *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**LINK DOWN SECONDS**<br>[1–900, *4*] | | |
| If TRUNK TYPE is *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**BACKGROUND BLOCK ERRORS FOR RECEIVE**<br>[1–4194303, *1000*] | | |
| If TRUNK TYPE is *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**BACKGROUND BLOCK ERRORS FOR TRANSMIT**<br>[1–4194303, *1000*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TRUNK TYPE is *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED BLOCKS FOR RECEIVE**<br>[1–4194303, *3120*] | | |
| If TRUNK TYPE is *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ERRORED BLOCKS FOR TRANSMIT**<br>[1–4194303, *3120*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**SEVERELY ERRORED FRAMING SECONDS**<br>[1–900, *2*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**ALARM INDICATION SIGNAL SECONDS**<br>[1–900, *2*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes:*<br>**UNAVAILABLE SECONDS**<br>[1–900, *10*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 15 minute interval is *yes* and TRUNK TYPE is not *e3a*:<br>**TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**CODE VIOLATION FOR RECEIVE**<br>[1–4194303, *359*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**CODE VIOLATION FOR TRANSMIT**<br>[1–4194303, *359*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**ERRORED SECONDS FOR RECEIVE**<br>[1–900, *86*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *86*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**SEVERELY ERRORED SECONDS FOR RECEIVE**<br>[1–900, *4*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**SEVERELY ERRORED SECONDS FOR TRANSMIT**<br>[1–900, *4*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**SEVERELY ERRORED FRAMING SECONDS**<br>[1–900, *2*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**UNAVAILABLE SECONDS**<br>[1–900, *10*] | | |
| If TRUNK TYPE is *t3a* or *e3a* and TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 15 minute interval parameters is *yes*:<br>**TUNE ATM LEVEL PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TUNE ATM LEVEL PERFORMANCE THRESHOLDS is *yes*:<br>**CELLS DISCARDED DUE TO HEC VIOLATIONS**<br>[1–4194303, *100*] | | |
| If TUNE ATM LEVEL PERFORMANCE THRESHOLDS is *yes:*<br>**CELLS DISCARDED DUE TO ATM LAYER HEADER ERRORS**<br>[1–900, *2*] | | |
| If TYPE OF PROFILE is *e3* and TUNE ATM LEVEL PERFORMANCE THRESHOLDS is *yes:*<br>**OUT OF CELL DELINEATION ANOMALIES**<br>[1–4194303, *100*] | | |
| **TUNE SUM OF ERRORS ALGORITHM THRESHOLDS**<br>[yes, *no*] | | |
| If TRUNK TYPE is *t3i* and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 2 ICIP CELL SUBLAYER–INVALID FLDS THRESHOLD**<br>[1–4194303, *3000*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TRUNK TYPE is *t3i* and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 2 ICIP SAR SUBLAYER–INVALID FLDS THRESHOLD**<br>[1–4194303, *3000*] | | |
| If TRUNK TYPE is *t3i* and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 2 ICIP SAR SUBLAYER–INCORRECT FLDS THRESHOLD**<br>[1–4194303, *3000*] | | |
| If TRUNK TYPE is *t3i* and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 2 ICIP CVG SUBLAYER–INVALID FLDS THRESHOLD**<br>[1–4194303, *600*] | | |
| If TRUNK TYPE is *t3i* and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 2 ICIP CVG SUBLAYER–INCORRECT FLDS THRESHOLD**<br>[1–4194303, *600*] | | |
| If TRUNK TYPE is *t3i* and and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 2 ICIP CLS SUBLAYER–ROUTING ERRS THRESHOLD**<br>[1–4194303, *600*] | | |
| If TRUNK TYPE is *t3i* and and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 2 ICIP CLS SUBLAYER–INVALID FLDS THRESHOLD**<br>[1–4194303, *600*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If MODULE TYPE is *ai* and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 2 THRESHOLD**<br>[1–4194303, *3000*] | | |
| If MODULE TYPE is *ai* and TUNE SUM OF ERRORS ALGORITHM is *yes*:<br>**LEVEL 3 THRESHOLD**<br>[1–4194303, *600*] | | |
| If MODULE TYPE is *ai*:<br>**TUNE BURSTY ERROR ALGORITHM LEVEL 3 THRESHOLDS**<br>[yes, *no*] | | |
| If MODULE TYPE is *ai* and TUNE BURSTY ERROR ALGORITHM LEVEL 3 THRESHOLDS is *yes*:<br>**NUMBER OF RECEIVED PDUs**<br>[1–86400000, *96000*] | | |
| If MODULE TYPE is *ai* and TUNE BURSTY ERROR ALGORITHM LEVEL 3 THRESHOLDS is *yes*:<br>**MINIMUM NUMBER OF ERRORED PDUs**<br>[1–864000, *3000*] | | |
| If MODULE TYPE is *ai* and TUNE BURSTY ERROR ALGORITHM LEVEL 3 THRESHOLDS is *yes*:<br>**RATIO THRESHOLD VALUE**<br>[1–100, *4*] | | |
| **TUNE <E3/T3> 24 HOUR INTERVAL PARAMETERS**<br>[yes, *no*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE <E3/T3> 24 HOUR INTERVAL PARAMETERS is *yes:*<br>**TUNE LAYER PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**LINE CODE VIOLATION***<br>[1–4194303, *3865*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**LINE ERRORED SECONDS***<br>[1–86400, *864*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**LINE SEVERELY ERRORED SECONDS***<br>[1–86400, *40*] | | |
| If TRUNK TYPE is *t3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**CODE VIOLATION FOR RECEIVE**<br>[1–4194303, *3820*] | | |
| If TRUNK TYPE is *t3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**CODE VIOLATION FOR TRANSMIT**<br>[1–4194303, *3820*] | | |
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is not *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**P-BIT PARITY CODE VIOLATION**<br>[1–4194303, *3820*] | | |

* This parameter is not applicable for AI-E3, Trunk-E3, or Trunk-E3S.

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is not *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED SECONDS**<br>[1–86400, *864*] | | |
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is not *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS**<br>[1–86400, *40*] | | |
| If TRUNK TYPE is *t3a* or *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *864*] | | |
| If TRUNK TYPE is *t3a* or *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *864*] | | |
| If TRUNK TYPE is *t3a* or *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *40*] | | |
| If TRUNK TYPE is *t3a* or *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *40*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TRUNK TYPE is *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED BLOCKS FOR RECEIVE**<br>[1–4194303, *12480*] | | |
| If TRUNK TYPE is *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ERRORED BLOCKS FOR TRANSMIT**<br>[1–4194303, *12480*] | | |
| If TRUNK TYPE is *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**BACKGROUND BLOCK ERRORS FOR RECEIVE**<br>[1–4194303, *4000*] | | |
| If TRUNK TYPE is *e3a* and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**BACKGROUND BLOCK ERRORS FOR TRANSMIT**<br>[1–4194303, *4000*] | | |
| If TYPE OF PROFILE is *t3*, TRUNK TYPE is not *t3a*, and TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**LINK DOWN SECONDS**<br>[1–86400, *16*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**SEVERELY ERRORED FRAMING SECONDS**<br>[1–86400, *8*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**ALARM INDICATION SIGNAL SECONDS**<br>[1–86400, *8*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes:*<br>**UNAVAILABLE SECONDS**<br>[1–86400, *10*] | | |
| If TUNE LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS**<br>[yes, *no*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**CODE VIOLATION FOR RECEIVE**<br>[1–4194303, *3584*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**CODE VIOLATION FOR TRANSMIT**<br>[1–4194303, *3584*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *864*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *864*] | | |

**FORM A-15. Entering an E3 or T3 Threshold Profile (BNS-2000 Nodes Only)** (continued)

| | | |
|---|---|---|
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**SEVERELY ERRORED SECONDS FOR RECEIVE**<br>[1–86400, *40*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**SEVERELY ERRORED SECONDS FOR TRANSMIT**<br>[1–86400, *40*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**SEVERELY ERRORED FRAMING SECONDS**<br>[1–86400, *8*] | | |
| If TUNE PLCP PATH LAYER PERFORMANCE THRESHOLDS for 24 hour interval parameters is *yes* and TRUNK TYPE is not *e3a*:<br>**UNAVAILABLE SECONDS**<br>[1–86400, *10*] | | |

## FORM A-16. Entering a Stratum 4 (SSM4) Clock (BNS-2000 Nodes Only)

| | | |
|---|---|---|
| **SOURCE TYPE**<br>[t1/e1, 64Kcc, 8kHz] | | |
| If SOURCE TYPE is 8kHz:<br>**PRIMARY REFERENCE MODULE ADDRESS**<br>[module address, *none*] | | |
| **SECONDARY REFERENCE MODULE ADDRESS**<br>[module address, *none*] | | |
| If SOURCE TYPE is t1/e1:<br>**LOSS OF SIGNAL TIMER**<br>[10ms, 15ms, 20ms, 25ms, *10ms*] | | |

## FORM A-17. Entering a Stratum 4 (STR4) Clock (BNS-2000 Nodes Only)

| | | |
|---|---|---|
| **CLOCK REFERENCE SOURCE**<br>[line, external, none] | | |
| If CLOCK REFERENCE SOURCE is external:<br>**RIB TYPE**<br>[*t1*, e1, 64kcc] | | |
| If RIB TYPE is t1:<br>**FRAMING FORMAT**<br>[d4, *esf*] | | |
| **PRIMARY RIB**<br>[*a*, b] | | |
| **REFERENCE REVERSION**<br>[*off*, on] | | |
| If RIB TYPE is 64kcc:<br>**STRATUM 4 CLOCK OUTPUT FEQUENCY**<br>[*t1*, e1] | | |
| If CLOCK REFERENCE SOURCE is line:<br>**PRIMARY REFERENCE MODULE ADDRESS**<br>[module address] | | |
| **SECONDARY REFERENCE MODULE ADDRESS**<br>[module address, *none*] | | |
| **REFERENCE REVERSION**<br>[*off*, on] | | |
| **STRATUM 4 CLOCK OUTPUT FEQUENCY**<br>[*t1*, e1] | | |
| If CLOCK REFERENCE SOURCE is none:<br>**STRATUM 4 CLOCK OUTPUT FEQUENCY**<br>[*t1*, e1] | | |

## FORM A-18. Entering an X.28 Signal for PAD Service

| | | |
|---|---|---|
| **X.28 PAD ID SERVICE SIGNAL**<br>[up to 72 chars double-quoted] | | |

## FORM A-19. Entering a Gateway for an X.25 Port

| | | |
|---|---|---|
| **GATEWAY ID**<br>[up to 8 chars] | | |
| **GATEWAY ADDRESS**<br>[4 to 15 digits] | | |
| **LOCAL X.3 PROFILE ID**<br>[up to 20 chars, mbit, *simple*, transparent] | | |
| **GATEWAY PDN PREFIX**<br>[0-9, *none*] | | |
| **PAD SUPPORT**<br>[*terminal*, host] | | |
| If PAD SUPPORT is *host:*<br>**REMOTE X.3 PROFILE ID**<br>[up to 20 chars, mbit, simple, *transparent*, none] | | |
| For a REMOTE X.3 PROFILE ID:<br>**REMOTE X.3 PARAMETER SET**<br>[comma-separated list of digits 1-22, *1–8, 12, 15*] | | |
| **GATEWAY CLOSED USER GROUP PROFILE ID**<br>[up to 8 chars, *none*] | | |
| **NETWORK CLOSED USER GROUP PROFILE ID**<br>[up to 8 chars, *none*] | | |
| **GATEWAY ENDPOINT NUMBER OR RANGE**<br>[0000-9999] | | |
| **Node X.121 Address**: | | |
| **DNIC**<br>[0000-9999, *none*] | | |
| **SERVICE REGION**<br>[000-999] | | |
| **SERVICE AREA**<br>[000-999] | | |
| **ENDPOINT NUMBER OR RANGE**<br>[0000-9999] | | |

## FORM A-20. Entering a Network (DNIC), Area (SR), Exchange (SA), or Station (EPN) Address*

| | | |
|---|---|---|
| **LEVEL**<br>[network, area, exchange, *local*, speedcall] | | |
| **TYPE**<br>[numeric, *mnemonic*, both] | | |
| If TYPE is *mnemonic* or *both*:<br>**MNEMONIC ADDRESS**<br>[up to 8 chars] | | |
| If TYPE is *numeric* or *both* and LEVEL is *network*:<br>**DNIC**<br>[0000-9999] | | |
| If TYPE is *numeric* or *both* and LEVEL is *network*:<br>**SUPPRESS PREFIX TO X25 PDN**<br>[yes, *no*] | | |
| If TYPE is *numeric* or *both* and LEVEL is *network*:<br>**SUPPRESS DCC TO X25 PDN**<br>[yes, *no*] | | |
| If TYPE is *numeric* or *both* and LEVEL is *area*:<br>**SERVICE REGION**<br>[000-999]: | | |
| If TYPE is *numeric* or *both* and LEVEL is *exchange*:<br>**SERVICE AREA**<br>[000-999]: | | |
| If TYPE is *numeric* or *both* and LEVEL is *local*:<br>**ENDPOINT NUMBER OR RANGE**<br>[0000-9999] | | |
| **PAD SUPPORT**<br>[yes, *no*] | | |
| If PAD SUPPORT is *yes:*<br>**X.3 PROFILE ID**<br>[up to 20 chars, mbit, *simple*, transparent] | | |

* Not *billing* or *directory assistance* (*?*)

## FORM A-20. Entering a Network (DNIC), Area (SR), Exchange (SA), or Station (EPN) Address* (continued)

| | | |
|---|---|---|
| **USE HIGH LEVEL PROTOCOL**<br>[*yes*, no] | | |
| If PAD SUPPORT is *yes* and USE HIGH LEVEL PROTOCOL is *yes:*<br>**HIGH LEVEL PROTOCOL**<br>[hex number ("*0x01*" for X.29) | | |
| If TYPE is numeric and LEVEL is *local*:<br>**CLOSED USER GROUP PROFILE ID**<br>[up to 8 chars, *none*] | | |
| **DIRECTORY ENTRY**<br>[up to 30 chars double-quoted, *none*] | | |
| **GROUP(S)**<br>[comma-separated list of up to four groups, *none*] | | |
| **ORIGINATING GROUP NAME SECURITY PATTERN(S)**<br>[comma-separated pattern list, same_as, *none*] | | |
| If ORIGINATING GROUP NAME SECURITY PATTERN is *same_as*:<br>**SAME AS WHICH ADDRESS LEVEL**<br>[network, area, exchange, *local*] | | |
| **ADDRESS** | | |
| If at least one GROUP is entered:<br>**INITIAL SERVICE STATE**<br>[in, *out*] | | |

* Not *billing* or *directory assistance* (*?*)

## FORM A-21. Entering a Speedcall Address

| | | |
|---|---|---|
| **LEVEL**<br>[network, area, exchange, local, speedcall] | speedcall | speedcall |
| **TYPE**<br>[numeric, *mnemonic*, both] | | |
| If TYPE is *mnemonic* or *both*:<br>**MNEMONIC ADDRESS**<br>[up to 8 chars] | | |
| If TYPE is *numeric* or *both*:<br>**ENDPOINT NUMBER OR RANGE**<br>[0000-9999] | | |
| **DIAL STRING ENTRY**<br>[up to 72 chars] | | |
| **DISPLAY DIAL STRING AS DIRECTORY ASSISTANCE?**<br>[yes, *no*] | | |
| **ORIGINATING GROUP NAME SECURITY PATTERN(S)**<br>[comma-separated pattern list, same_as, *none*] | | |
| **INITIAL SERVICE STATE**<br>[in, *out*] | | |

## FORM A-22. Entering an X.25 Host or PDN Address

| | | |
|---|---|---|
| **LEVEL**<br>[network, area, exchange, local, speedcall] | | |
| **TYPE**<br>[numeric, *mnemonic*, both] | | |
| **MNEMONIC ADDRESS**<br>[up to 8 chars] | | |
| If TYPE is *numeric* or *both*:<br>**SERVICE REGION**<br>[000-999] | | |
| If TYPE is *mnemonic*:<br>**DNIC**<br>[0000-9999] | | |
| **PAD SUPPORT**<br>[yes, *no*] | | |
| If PAD SUPPORT is *yes:*<br>**X.3 PROFILE ID**<br>[up to 20 chars, mbit, *simple*, transparent] | | |
| **USE HIGH LEVEL PROTOCOL**<br>[*yes*, no] | | |
| If USE HIGH LEVEL PROTOCOL is *yes:*<br>**HIGH LEVEL PROTOCOL**<br>[hex number *0x01* for X.29] | | |
| **DIRECTORY ENTRY**<br>[up to 30 chars double-quoted, *none*] | | |
| **GROUP(S)**<br>[comma-separated list of up to four groups, *none*] | | |
| **ORIGINATING GROUP NAME SECURITY PATTERN(S)**<br>[comma-separated pattern list, same_as, *none*] | | |
| **INITIAL SERVICE STATE**<br>[in, *out*] | | |

## FORM A-23. Entering a Group Address Resolver (GAR) Module (BNS-2000 Nodes Only)

| | | |
|---|---|---|
| **OBJECT**<br>[. . . *gar* . . .] | | |
| **MODULE ADDRESS** | | |
| **DOWNLOAD SERVER**<br>[*controller*] | | |
| **SOFTWARE VERSION**<br>[*standard*] | | |
| If DOWNLOAD SERVER is not *controller:*<br>**SOFTWARE VERSION** | | |
| **COMMENT**<br>[up to 60 chars double quoted, *none*] | | |
| **MODULE MEASUREMENTS**<br>[yes, *no*] | | |

## FORM A-24. Entering a DKAP Module

| | | |
|---|---|---|
| **COMPONENT**<br>[module, chnlset] | module | module |
| **MODULE ADDRESS** | | |
| **COMMENT**<br>[up to 60 chars, double-quoted] | | |
| **HARDWARE CONFIGURATION TYPE**<br>[up to 8 chars] | | |
| **DOWNLOAD SERVER**<br>[*controller*] | | |
| **SOFTWARE VERSION**<br>[standard] | | |
| **UPLOAD SERVER**<br>[*none*] | | |
| If UPLOAD SERVER is other than *none*:<br>**UPLOAD ALWAYS BEFORE DOWNLOAD**<br>[yes, *no*] | | |
| If UPLOAD ALWAYS BEFORE DOWNLOAD is *no*:<br>**UPLOAD ONLY AFTER FAULT**<br>[yes, *no*] | | |
| **NUMBER OF USER CHANNELS**<br>[1-507, *100*] | | |

## FORM A-25. Entering a DKAP Channel Set for Host, Terminal, or Two-way Service

| **COMPONENT**<br>[module, chnlset] | chnlset | chnlset |
|---|---|---|
| **MODULE ADDRESS** | | |
| **CHANNEL SET ID**<br>[1-63] | | |
| **NO. OF CHANNELS PER CHANNEL SET**<br>[1-507, *100*] | | |
| **SERVICE TYPE**<br>[host, *terminal*, 2way] | | |
| **GROUP**<br>[up to 8 chars] | | |
| If SERVICE TYPE is *terminal* or *2way:*<br>**PREDEFINED DESTINATION**<br>[*none*] | | |

# Index

Entries are listed character by character in alphabetical and numerical order: for example, AWJ16B precedes AWJ2.

System commands and page numbers referring to illustrations appear in **bold** type; document titles, system directories, and system file names appear in *italic* type.

The term "MRC" refers to the maintenance and remote control functions for both the CCM and ECPU node hardware configurations.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