



***StarKeeper*[®] II NMS Core System Guide**

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Preface

StarKeeper® II NMS manages, controls, and diagnoses the complete line of BNS-2000 and BNS-2000 VCS (formerly *Datakit*® II Virtual Circuit Switch (VCS)) nodes as well as concentrators, servers, bridges, routers, gateways, and other network elements. *StarKeeper* II NMS collects alarm information, billing data, and performance measurements from the network and generates reports on request. Two-way communication between *StarKeeper* II NMS and the network allows one centrally located administrator to manage equipment at many locations.

StarKeeper II NMS architecture consists of one or more Core Systems optionally connected to one or more Graphics Systems running various graphics applications. The Core Systems maintain network connectivity and databases, and perform basic network management functions.

The *StarKeeper* II NMS SNMP Proxy Agent is an optional Core System application. This application is provided with a Core System, but its installation is optional.

The *StarKeeper* II NMS Graphic System is an 8-user system. It provides configuration management and analysis, enhanced alarms and diagnostics capabilities, and graphical displays of performance and traffic information. The following graphics applications are included with a Graphics System:

- *StarKeeper* II NMS Graphics System Platform, including
 - Bulletin Board
 - Cut-Through
 - Workstation Administration
- *StarKeeper* II NMS Network Builder
- *StarKeeper* II NMS Network Monitor
- *StarKeeper* II NMS Performance Reporter

Local Area Network Netstations can also be connected to the host machine, allowing multiple users to access the Graphics System software. For small networks, the Graphics System software can reside on the same host machine as the Core System. This configuration is referred to as the Co-resident System. For large networks, multiple Core Systems can divide the load either geographically or functionally.

What's New in This Document for Release 10.0

This document is reissued because of changes and additions made since Release 8.0 of *StarKeeper II* NMS. The following list details these changes:

- Support for BNS-2000 Release 5.0
- Support for BNS-2000 VCS Release 6.0
- Changes in software packaging
 - The *StarKeeper II* NMS Core System Support for SMDS software is automatically installed with the *StarKeeper II* NMS Core System software package.
 - The *StarKeeper II* NMS SNMP Proxy Agent for SMDS and *StarKeeper II* NMS SNMP Proxy Agent for Frame Relay software packages are combined into one, called the *StarKeeper II* NMS SNMP Proxy Agent.
 - The *StarKeeper II* NMS SNMP Proxy Agent software is optionally installed with the *StarKeeper II* NMS Core System software package. The *StarKeeper II* NMS Core System software package includes the license required to install the *StarKeeper II* NMS SNMP Proxy Agent software.
 - The *StarKeeper II* NMS Network Builder Support for Frame Relay and *StarKeeper II* NMS Network Builder Support for SMDS software packages are included as part of the *StarKeeper II* NMS Network Builder software package.
 - The *StarKeeper II* NMS Graphics System software package comes with an eight-user license. The single-user version of this software package is no longer available.
- Year 2000 Compliance: *StarKeeper II* NMS R10.0 provides *Year 2000 Compliance* through the support of four-digit years in most Date fields; two-digit years are also supported in an unambiguous way. (See **Chapter 1** for more details.)

Purpose of the Document

This guide provides complete, step-by-step instructions for performing the tasks of a network administrator on a *StarKeeper II* NMS Core machine. This guide gives instructions on how to set up the database, handle alarms, administer the system on a daily basis, generate and interpret reports, and maintain *StarKeeper II* NMS. Refer to the *StarKeeper II NMS Graphics System Guide* for coverage of the Graphics System-based packages.

This guide also provides an overview of the format and syntax of *StarKeeper II* NMS commands and alarm messages.

Refer to the *Getting Started with StarKeeper II NMS R10.0* guide that is shipped with your order to facilitate initial installation and start-up procedures.

Organization

This guide is divided into the following chapters.

- Chapter 1** presents preparatory material for using the *StarKeeper II* NMS, including a discussion of the *StarKeeper II* NMS administrator's qualifications and responsibilities, a general discussion of the *StarKeeper II* NMS commands, a sample network, and an explanation of the network addressing scheme.
- Chapter 2** includes an overview of the format and syntax of *StarKeeper II* NMS commands and alarm messages, and describes addressing, network addresses, wild cards, anchors, and node name expansion.
- Chapter 3** provides a tutorial on the functions performed at the System Administration Menu plus administration of uploads and downloads of node databases, security, the assigning of commands to certain users (command partitioning), automating routine tasks, and use of the Programmer's Interface.
- Chapter 4** briefly introduces the INFORMIX® database and provides complete instructions on how to build and make changes to the network configuration database tables. This chapter also provides instructions on converting an existing *StarKeeper II* NMS database when installing a new system.
- Chapter 5** provides complete instructions for monitoring external alarms (from the network) and internal alarms (from *StarKeeper II* NMS). This chapter also includes complete instructions on how to manipulate the way the alarms are displayed (alarm conditioning) and how to browse through log files that contain network messages.

- Chapter 6** provides a description of the performance, billing, and alarm reports, with complete instructions on how to retrieve and interpret the reports. This chapter also includes instructions for producing custom reports.
- Chapter 7** describes how to maintain *StarKeeper II* NMS, and provides procedures to recover from system problems, to prevent problems from occurring, and to backup the system.
- Appendix A** includes an overview of the installation task.
- Appendix B** describes how to configure a second disk on an HP.
- Appendix C** provides procedures for reconfiguring HP-UX® system parameters.
- Appendix D** provides procedures to configure a printer and troubleshooting guidelines.
- Appendix E** furnishes hardware assembly instructions for the host machine (for software package systems only), and procedures for establishing a host connection to the hub node.
- Appendix F** provides a summary of all commands—in a tabular form—by type of command, and provides a summary of all configuration commands for quick reference.
- Appendix G** provides instructions for reinitializing the *StarKeeper II* NMS database.
- Appendix H** lists node and *StarKeeper II* NMS messages (for use with the programmers interface feature described in Chapter 3).
- Appendix I** lists error messages associated with the node upload/download feature (each error message has a description and a recommended course of corrective action).
- Appendix J** describes the SCP Error Codes that can appear in the Event Log.
- Appendix K** furnishes the special considerations for customers who have large frame relay performance database.

Document Conventions

Certain conventions are used in this document to help make it more usable.

- Some screen displays are boxed:

This is a screen display

- Messages that appear on the screen (for example, system responses, alarms, prompts, and so forth) are printed as follows:
device for printer_name: io_port
- User input instructions appear in bold italic font: Type ***/usr/bin.***
- Command names are shown in bold font: **help**.
- Directory and file names are shown in italic font:
\$CNMS_DBS/ahp/alarm_log.
- Variable information, either entered from the keyboard or displayed on the screen, is enclosed in angle brackets: <name>.
- Keys that you press are shown in a box: Enter .
If two keys are shown, press them together. For example, Ctrl **q** means to press (and hold) the Ctrl key and then enter a q; once both keys are depressed, you release them both.
- Procedural steps are marked by consecutive step numbers.
- Unless otherwise specified, references to other chapters that appear in bold refer to chapters in this guide: **Chapter 1**.

Supported Products

For a complete listing of supported products, see the *StarKeeper II NMS Planning Guide*.



NOTE:

Beginning with *StarKeeper II NMS* Release 7.0, support for a number of systems has been dropped including ISN, old nodes, and so forth. When prompts for unsupported equipment appear on the screen, disregard these prompts. If used, the results will be undefined.

Related Documentation

In conjunction with this guide, you may need to refer to the following documents:

StarKeeper® II NMS Documents

- *StarKeeper® II NMS Planning Guide*
- *StarKeeper® II NMS Graphics System Guide*
- *StarKeeper® II NMS SNMP Proxy Agent Guide*

BNS-2000, BNS-2000 VCS, and Data Networking Products Documents

Refer to the *Publications* brochure for information on BNS-2000, BNS-2000 VCS, and Data Networking Products documentation.

Hewlett-Packard Documents

- *Hewlett-Packard DeskJet® 560C Printer User's Guide*
- *Hewlett-Packard DeskJet® Cxi/870 Cse User's Guide*
- *Hewlett-Packard LaserJet® IIP Printer User's Manual*
- *Hewlett-Packard LaserJet® IIIP Printer User's Manual*
- *Hewlett-Packard LaserJet® 4 and 4M Printer User's Manual*
- *Hewlett-Packard LaserJet® 6P/6MP Printer User's Manual*
- *Hewlett-Packard PaintJet® Color Graphics Printer User's Guide*
- *HP Visual User Environment 3.0 Quick Start*
- *HP-UX References Manuals, Volumes 1 through 3*
- *Installing HP-UX 10.20 and Updating from HP-UX 10.0x to 10.20*
- *Upgrading from HP-UX 9.x to 10.0*
- *Using Your HP Workstation*

INFORMIX Documents

4GL Documents

- *4GL User Guide*
- *4GL Reference Manual (Volumes 1, 2)*
- *4GL Supplement*
- *4GL by Example*
- *Guide to SQL: Tutorial*
- *Guide to SQL: Reference*

SQL Documents

- *SQL User Guide*
- *SQL Reference Manual*
- *Quick Reference Guide*
- *SQL Quick Syntax Guide*
- *SQL Supplement*
- *Guide to SQL: Tutorial*
- *Guide to SQL: Reference*

SE Documents

- *DB-Access User Manual*
- *Error Messages*
- *SE Administrator's Guide*
- *SQL Quick Syntax Guide*
- *Guide to SQL: Tutorial*
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UNIX® System Documents

- *UNIX® User Reference Manual*

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Using the *StarKeeper* II NMS Core System

1

StarKeeper II Network Management System (NMS) is a system of programs that manages a network of BNS-2000 or BNS-2000 VCS packet-switching nodes. The system is comprised of "C" language, UNIX or HP-UX shell, and INFORMIX 4GL, ESQL/C, and ACE programs. Using *StarKeeper* II NMS, an administrator can monitor the operation of the network, issue commands to maintain the network, collect data, and generate performance, billing, and alarm reports.

StarKeeper II NMS runs on a supported host computer under the host's operating system (OS) and uses INFORMIX for its database management. Lucent Technologies offers training courses to teach all the necessary skills for effective management of your network using *StarKeeper* II NMS. Refer to the **Preface** for training information.

 IMPORTANT:

Support for a number of systems—including BNS-1000, ISN, and other previously supported nodes—has been discontinued. Prompts for unsupported node equipment might appear on the console screen and in screen captures that appear in this document. They are to be disregarded. If they are used, the results will be undefined. In addition, text references to BNS-2000 VCS refer to *Datakit* II VCS, unless *Datakit* II VCS is specifically mentioned in instances of interworking. Screen captures that refer to *Datakit* II VCS refer to BNS-2000 VCS and/or *Datakit* II VCS, depending on the product that reflects that particular software release.

Year 2000 Compliance

StarKeeper II NMS R10.0 supports use of four-digit years in most user-specified date fields. Two-digit years are also supported, with the following assumptions:

- If a two-digit year, XX, is entered that is between 00 and 70 (inclusive), the four-digit year 20XX will be used
- If a two-digit year, YY, is entered that is greater than 70, the four-digit year 19YY will be used

Billing (call accounting) dates will be correct only when data is received from a *Year-2000 Compliant* node (BNS-2000 R4 and BNS-2000 VCS/*Datakit II* VCS R6 and later). *StarKeeper II* NMS relies on the dates provided when the node delivers call accounting data; non-compliant nodes will not send accurate dates starting in the year 2000.

Some report headings will continue to use two-digit years in the Date field. These will represent the appropriate year and should not be ambiguous to you.

The *StarKeeper II* NMS Administrator

The *StarKeeper II* NMS administrator is the person responsible for the operation and effective usage of *StarKeeper II* NMS. Administrator qualifications and responsibilities are described below.

Qualifications

A *StarKeeper II* NMS administrator should have enough knowledge of the operating system (OS) and the host computer to understand the relationship between *StarKeeper II* NMS and the host system. The administrator must set up and maintain *StarKeeper II* NMS and be able to diagnose OS-related problems without calling an OS administrator (unless the problems are complex or subtle).

To be effective, a *StarKeeper II* NMS administrator should have knowledge of an OS editor (preferably **vi**) and shell programming. The administrator also needs a basic knowledge of data communications, BNS-2000 or BNS-2000 VCS, the OS, INFORMIX database management system, *StarKeeper II* NMS, and administration practices for the host computer.

Additional knowledge is required for administrators who want to take advantage of some of the powerful options of *StarKeeper II* NMS. Examples are writing shell scripts or programs in the C Programming Language for the *StarKeeper* Programmer's Interface (**pi** command) or writing customized reports based on the INFORMIX database. Refer to the section titled **Producing Custom Reports** in **Chapter 6** for instructions.

Typical OS/*StarKeeper* II NMS Administrator's Responsibilities

The administrator is responsible for setting up OS administrative procedures for the *StarKeeper* II NMS host computer, for maintaining and updating these procedures, and for ensuring that they are followed by *StarKeeper* II NMS users. The administrator is responsible for analyzing system performance (both *StarKeeper* II NMS and the host computer), investigating trends and abnormalities in how the network is functioning, planning for growth, and installing new *StarKeeper* II NMS Releases. The administrator oversees the entire *StarKeeper* II NMS system, including OS administration.

The following list represents some of the typical responsibilities of a *StarKeeper* II NMS administrator. It is not a definitive list, but it does illustrate the overall level of experience required:

1. Shut down and reboot the system.
2. Do daily, weekly, and monthly file system saves.
3. Recover from system crashes.
4. Monitor system performance. This includes monitoring the placement of file systems to create strategies for better performance and the monitoring of the OS parameters to ensure they are set properly.
5. Configure the network by building and maintaining the network database.
6. Set up procedures for new login requests and system security, especially for dial-ins.
7. Maintain communication interfaces to the *StarKeeper* II NMS hosts, including security.
8. Monitor the size of database files to ensure that they do not exceed normal size limitations.

For New *StarKeeper* II NMS Users

If you are using *StarKeeper* II NMS for the first time, this list will help you find the appropriate tasks in the documentation as you begin to operate and administer *StarKeeper* II NMS.

- a. Establish and administer connections.
- b. Configure the database.
- c. Define thresholds and filters for alarms.
- d. Obtain and interpret reports.
- e. Diagnose and correct network problems.
- f. Maintain *StarKeeper* II NMS system on the host computer.

Each task is discussed below with pointers to the appropriate *StarKeeper* II NMS documentation.

Establish and Administer Connections

Once *StarKeeper* II NMS is installed and operational, you can establish the physical connections from the host machine to the network hub node. At each node you must administer the database information for each connection class that you intend to use. Refer to **Chapter 3** for complete instructions.

Configure the Database

After the *StarKeeper* II NMS connections are set, you can configure the database. Refer to **Chapter 4** for procedures required to build the configuration database.

Database configuration is made easier with the optional Network Builder application. This is a forms-driven interface that populates network element databases at the node and at the *StarKeeper* II NMS database in one operation. The application also performs analysis and "what if?" scenarios to help optimize your network.

Define Thresholds and Filters for Alarms

You can choose to receive all alarms from your connected products, or you can select certain alarms (filtering) or set the conditions for receiving alarms. For example, you may opt to see an alarm only after it has occurred three times in a specified time interval (thresholding). Another common activity is changing the severity of an alarm. Refer to **Chapter 5** for procedures required to configure the alarms database.

Configuration and isolation of alarms is easy and robust using the optional Network Monitor application. Visual displays show the status of the network and allow you to do diagnostics.

Obtain and Interpret Reports

As the *StarKeeper* II NMS administrator, you will periodically want to generate reports that show the health of your network. There are several types of reports available: performance, billing, and alarm. **Chapter 6** describes the standard reports available. Run **help** for complete coverage of the **report** command entry.

You can also develop your own customized reports with *StarKeeper* II NMS. Refer to the section titled **Producing Custom Reports** in **Chapter 6** for complete instructions.

Using the optional Performance Reporter application, you can obtain reports that are visual presentations of numerical statistics, to aid in the interpretation of the gathered data. Performance reports for newer modules added since *StarKeeper* II NMS Release 3.0 are only available on Performance Reporter.

Diagnose Network Problems

You can use the reports and alarms of *StarKeeper* II NMS to diagnose network problems. The optional **smdsmeas** command, in particular, produces on-demand reports for AI modules and SMDS trunks. Refer to **Chapter 5**, **Chapter 6**, and the BNS-2000 Data Networking Products documentation for additional information.

You may also find the individual maintenance guides for the products in your network helpful. For example, if you are receiving alarms from a node, you may want to refer to the applicable messages reference for more information about the particular message, and the applicable maintenance guide for diagnostic procedures to correct the problem.

Maintain *StarKeeper* II NMS

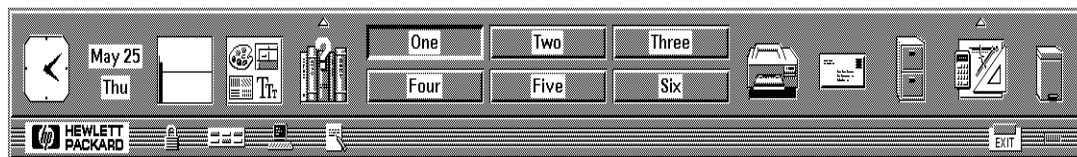
Chapter 7 provides information to help diagnose *StarKeeper* II NMS problems as well as preventive maintenance procedures to prevent problems from occurring.

The HP Visual User Environment

The *StarKeeper* II NMS Core System facilities are accessed via the HP Visual User Environment (HP VUE). This section provides a brief description of how you can access Core System commands and other facilities of HP VUE. For more information on how to use the Core System workstation, see the HP document titled *Using Your HP Workstation* that came with your system. In addition, extensive on-line help is available in support of HP VUE. To access the HP VUE *Help Manager*, choose the “?” icon on the front panel.

Logging In

When you enter your login and password on the HP login screen, the HP VUE front panel appears on the screen (see the figure below), and an *hpterm* window is automatically invoked in *Workspace One*. If you are on the system console, a second window is invoked at login titled *console*. This window receives all the system messages destined for the system console.



All interaction with the Core System is accomplished using the OS command-line interface of the *hpterm* windows. In addition to the windows invoked at login, you can request additional *hpterm* windows by choosing the terminal icon on the front panel, just below the *Help Manager* control and to the left of the array of six workspace buttons.

No Windows Option

Some procedures or process requests may indicate a need to login using the *No Windows* option (for example, during installation). This is accomplished by choosing *No Windows* on the *Options* menu of the login window.

IMPORTANT:

You must terminate your current session before logging in with a different option setting. (See the section **Logging Off**.)

Printing

Assuming that you have administered your printers as described in **Appendix D**, printing from Core System applications is handled by the application software. Print requests made for any application will be directed to the appropriate printer automatically.

Printing of other items is accomplished using drag-and-drop of files onto printer icons accessed via the printers subpanel, located just to the left of the Workspace controls on the front panel.

Capturing Images

To capture screen images for later printing, use the following procedure:

Procedure 1-1. Using the Capture Screen Utility

1. Open the **General Toolbox** from the **Toolbox** subpanel accessed via the **Toolbox** icon on the HP VUE front panel (just to the left of the **Trash Can**).
2. Open the **Utilities** folder (double-click on its icon).
3. Start the **XwdCapture** application (double-click on its icon).
4. Enter the output filename and click .



NOTE:

The filename you type must end with **.xwd**.

5. If you requested a window capture, click the mouse anywhere within the window you want to capture. The screen will be saved.

Printing Files

To print any file, including captured screen images, use the following procedure:

Procedure 1-2. Using the Printers Sub-Panel

1. Locate the desired file via the *File Manager*. See the next section, **Accessing Your Directory**, for details.
2. To access all the printers configured for this workstation, open the *Printers* sub-panel by choosing the *Printers* control on the HP VUE front panel. You do not need to open the sub-panel if there is only one printer configured, or if you want to send the file to the default printer (the one at the top of the sub-panel).
3. Drag the file located in step 1 and drop it onto the desired printer icon. If there is only one printer or you want to use the default printer, you may simply drop the file onto the *Printers* control on the front panel. To determine printing status, click on a printer icon to bring up the *SharedPrint/UX[®]-Manager*. Refer to your HP VUE documentation for more information on printing.

Accessing Your Directory

Click on the *File Manager* control (the file cabinet icon) on the front panel to access a window containing a graphical representation of your home directory. You can use this window to traverse your subdirectories and manipulate files and folders. Files saved by Core System applications will usually be found somewhere within your own directory structure.

Logging Off

To log off the system, use the *Exit* control located at the lower right of the front panel. You will be asked to confirm your request.

⇒ NOTE:

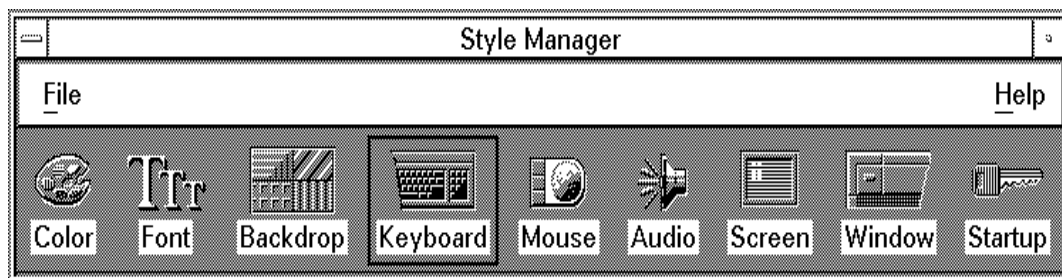
Any windows or applications left up at log-off time may be retained, depending upon the settings you choose via the *Startup* control on the *Style Manager* sub-panel.

Special HP VUE Capabilities

Although the intent of this section is not to provide a comprehensive presentation of HP VUE capabilities, some of these will be highlighted below due to their extensive use in this product or because they provide enhanced functionality worthy of special mention.

Style Manager

The *Style Manager* is a set of utilities that controls the way your system looks and operates. The *Style Manager* control is located just to the left of the *Help Manager* icon. Clicking on this icon displays a sub-panel providing access to these utilities (see the figure below). All settings are maintained on a per-user basis, so you can feel free to customize your workspace as desired.



Workspaces

The array of six buttons in the middle of the front panel controls which workspace you want to use at any given time. Each workspace can be considered as an independent work area that you may move between at any time without affecting the contents of any of the workspaces. Workspaces may be named using the control located just below the *Style Manager* icon. Windows can populate one or more workspaces by using the appropriate item on the window menu (accessed via the — icon in the upper left corner of every window).

Keyboard Shortcuts

All interaction with HP VUE can be accomplished via the keyboard, without use of the mouse. For example, menus and menu items can be accessed by using the mnemonic identified as the underlined character in the menu or item name.

Holding **ALT** while pressing the desired mnemonic displays the associated menu; you can then use the menu item mnemonic (without **ALT**) to execute the associated command. Also, within forms **Tab** will traverse the controls on the form; arrow keys will traverse buttons within a control; **Space** will set a button.

Hitting **ESC** while holding **ALT** will bring keyboard focus to the front panel. You can then use the arrow keys to traverse the front panel controls; **Return** will open a sub-panel and **Space** will emulate a mouse click on the highlighted control or icon.

There are many other keyboard equivalents that you may find useful. Refer to the HP documentation for full details on keyboard equivalents.

Commands

The *StarKeeper* II NMS administrator logs onto the system using the *cnmsadm* login; this produces the *SK:* prompt. Other logins produce a *\$* prompt. Most of the commands discussed in this guide are available to the *cnmsadm* login from the *SK:* prompt (some require you to change to the root directory and become the superuser); other logins have access only to those commands granted to the user (see the **Command Partitioning** section in **Chapter 3**).

The *StarKeeper* II NMS administrator/user has access to commands to control and manage network functions. The commands at your disposal include the commands that are part of *StarKeeper* II NMS, as well as the commands developed for your node and OS commands.

StarKeeper II NMS commands can be issued in a variety of ways: one-line, prompted-entry, and menu-selected. Refer to **Chapter 2** for a complete discussion of how to issue these commands. You must be familiar with this topic to perform the procedures and instructions of a *StarKeeper* II NMS administrator/user.

Chapter 2 also discusses how to get on-line help for all *StarKeeper* II NMS commands. **Appendix F** provides a brief description of each *StarKeeper* II NMS command, listed in alphabetical order.

Network Commands

The *StarKeeper* II NMS administrator can send network commands to any monitored node from the *StarKeeper* II NMS via the pass-through feature. Network commands are defined as the regular node commands; the pass-through feature provides the capability to send and execute the network commands. The pass-through feature is exercised by using a **-n <nodename>** option to the regular node command. For a detailed discussion, refer to the section titled **Pass-through of Network Commands** in **Chapter 2**.

The subsequent *StarKeeper* II NMS **setnode** command, once entered, allows all commands to be directed to the specified node until an **exit** command is entered. Also refer to **Issuing Network Commands** section in **Chapter 2**. In addition, the **console** command provides less restrictive access to the console port than pass-through for more extensive diagnostic capabilities. Refer to the discussion of the **console** command in the **Connections to the MRC** section in **Chapter 3**.

There are two *StarKeeper* II NMS commands to support the node's Session Maintenance feature: **smverify** and **smstat**. For complete coverage of the Session Maintenance feature, refer to the node manuals.

In addition, the *StarKeeper* II NMS **smdsmeas** command accesses node AI and trunk data for SMDS measurement reports. For complete coverage of the SMDS feature, refer to the node manuals.

For a list of node commands and their valid abbreviations, refer to **Appendix F**.



NOTE:

When using the Hewlett-Packard C1429A PC-101 Enhanced Vectra Keyboard, you must use **Shift** **ESC** in place of **Delete** wherever it says to use **Delete** in this document. If you are using this keyboard and running the HP VUE, you must use **Shift** **Del** in place of **Delete**.

Sample Network

The following figure shows a sample network that provides a reference for examples used in this guide. It is not intended to be a guide to designing or naming networks and their elements. The network shown is fictitious and any similarity to an existing network is coincidental.

The sample network is named *national*. The equipment is located in two areas; one called *west* and one called *east*. Each area has two exchanges. The west area has an exchange called *garden* and another called *957*; while the east area has an exchange called *band* and another called *forest*. System services, such as host computers, have service addresses that usually reflect the exchange designation; like *tuba* and *drum* in the *band* exchange. Network nodes also are named and their naming often has a pattern but is not necessarily linked to the exchange name.

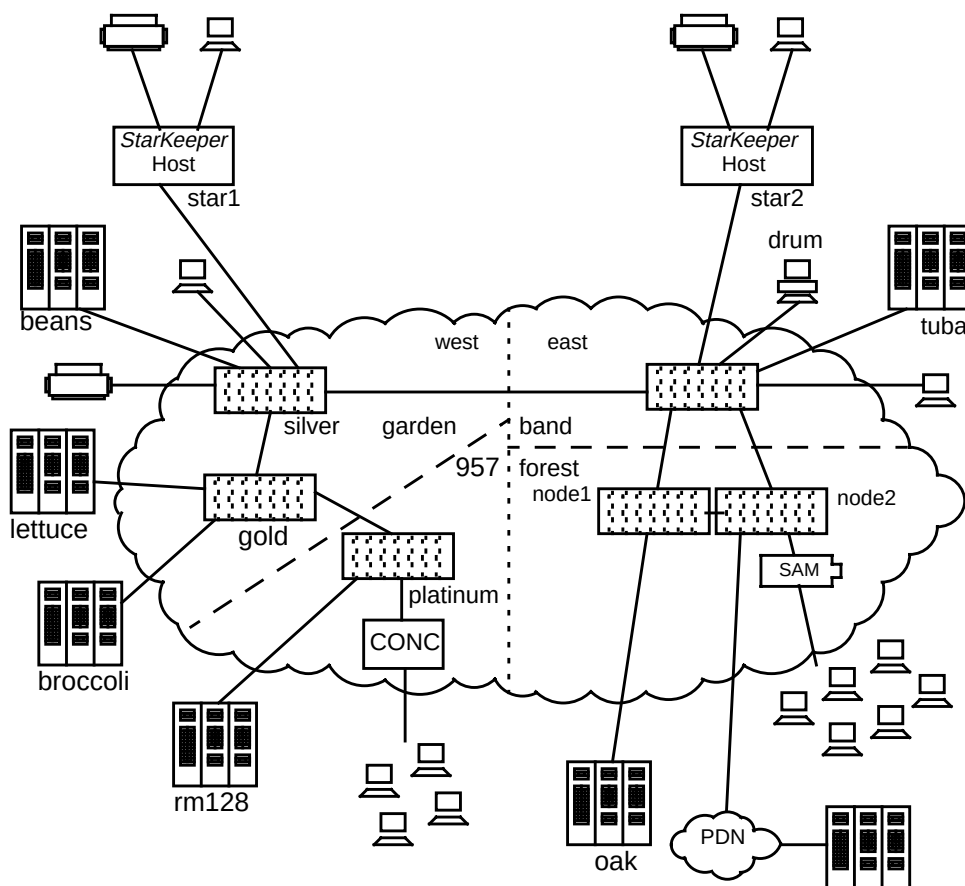


Figure 1-1. A Sample Network (called national)

Addressing

Addressing in data communications is similar to addressing for postal mailings. Any destination to which you send a message has an address and any originator that sends a message has an address. While each destination has an address, there can be any number of routing paths to deliver a message. Also, the routing standards may be different for your local environment than they are externally.

Within the network, *StarKeeper* II NMS recognizes a four-level, alphanumeric, addressing scheme. Some node destinations may also have X.121 addressing, which is a numeric addressing scheme usually associated with X.25 data services. Elements in the network, but not within the physical confines of the node, are further identified (addressed) with a network address called **netaddr**. These addressing methods are discussed in the following subsections.

Four-level Mnemonic Addressing

The network administrator has assigned addresses to every callable destination (for example, a host). The address for each destination (and origin) may contain up to four parts. The addressing scheme is as follows:

network/area/exchange/local_name

The "/" (slash) character separates the parts of an address. Each part can consist of up to eight alphanumeric characters, such as:

national/east/band/tuba

X.121 Addressing

X.121 is the international numbering scheme for Public Data Networks (PDNs) that allows a terminal connected to one PDN to address a destination located on another PDN. Asynchronous endpoints that have access to, or will be accessed by, endpoints on a 5ESS® Switch, an X.25 host, or an X.25 PDN *must* have X.121 numeric addresses. The address for each destination (and origin) has four parts. The addressing scheme is as follows:

DNIC/SR/SA/EPN

Where

- DNIC - Data Network Identification Code (4 digits)
- SR - Service Region (3 digits)
- SA - Service Area (3 digits)
- EPN - End-point Number (4 digits)

For example: 1111/444/333/2222

Network Addressing

A network address (also called **netaddr**) is a representation used to locate a specified network element. It applies to all node types supported by *StarKeeper II NMS*. A network address answers the question, "Where did an alarm come from?"

The network address specifies an element in the network using node, module, and module component identifiers. When an element to be addressed is not within the physical confines of the node, the network address uses the path of connectivity to locate it. Nodes send address information embedded in alarms and they receive address information in commands from *StarKeeper II NMS*.

A network address is different from routing information. There may be many paths traceable to an element in the network, but that element has only one network address. An analogy would be an address of a building; while there are many ways to get to the building, it has only one address.

The addressing scheme uses the following convention:

node_name:component1/component2/component3

Where

- **node_name** represents the node name. When BNS-2000 or BNS-2000 VCS nodes are involved, the node name can contain slashes. An example would be:
area1/exchange1/node1:component1/component2/component3
- **colons** are used to separate the node identification from the components. Therefore, the node is always shown to the left of the colon, and the network components to the right.
- **slashes (/)** to the left of the colon are part of the node addressing scheme to identify the node; slashes to the right of the colon separate addressable components connected to the node. Typically, a "/" appears where components are connected to each other by cables or fiber trunks.
- **component1** specifies the path of the network element in the node **node_name**. An example of **component1** is a module such as TY12. **component2** is usually a concentrator or a multiplexer. **component3** would be used for something such as a BSC3270 control unit (see the example below). A component is in the **x.y.z** form, where
 - x is the slot number where the module is inserted.
 - y is typically a physical component of the module. An example would be a port.
 - z is typically a logical component of the module or port. An example would be a channel or a Frame Relay Data Link Control Identifier (DLCI).

Not all modules have logical or even physical components. In that case, the full identification for the address within the given component is x. Since x provides sufficient identification, y and z are not necessary. When a module has physical, but no logical components (for example, a TY12 module), the address is x.y. However, when a module has logical components on a single physical port, it cannot omit y and use x.z only. The component y should be represented, even when it is not needed, by the default value of 1. Hence, the address would be x.1.z, not x.z.

The network address representation of the M1 Frame Relay module includes both physical (port) and logical (DLCI) components. The slot, port, and DLCI are stored in **component1** as x.y.z.

The network address representation of the M2 Frame Relay module includes a multilevel logical component (DLCI on a virtual port). In this type of network address, the slot and port are stored in **component1** as x.y, and the virtual port and DLCI are stored in **component2** as 0.y.z, where 0 is a place holder (indicating a multilevel logical component), y represents the virtual port, and z represents the DLCI.

Illustrating the Network Addressing Scheme

An example of a network address for a control unit connected to a node through a concentrator is shown below. Notice that the network address can best be deciphered by reading it from right to left.

mynode:5/4.1/2.4

(nodename:module_in_node/concentrator_slot.slot_port/control_unit_terminal)

This is the address of a terminal connected via port 4, control unit 2, that is connected to port 1, module 4 of a concentrator that is linked to an interface module in slot 5 of **mynode**.

The following figure illustrates the relationship between the node and elements in this example.

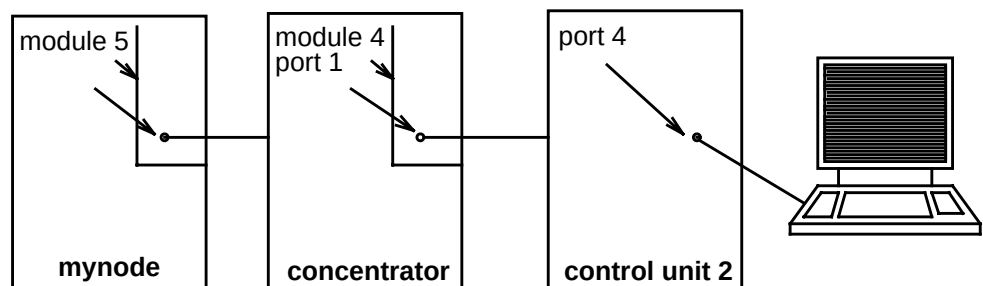


Figure 1-2. Illustrating the Network Addressing Scheme

Further Examples

1. Examples of network addressing for an *asynchronous* module, such as a TY12 in a node are shown below:

platinum:5	is the address of the module in slot 5 of the platinum node.
platinum:5.4	is the address of port 4 on the module in slot 5 of the platinum node.
platinum:5/4.3	is the address of port 3 on the module in slot 4 of the concentrator that is linked to the interface module in slot 5 of the platinum node.
2. An example of network addressing for a *synchronous* module (such as BSC3270) is shown below:

platinum:5.4/2.1	is the address of terminal 1 on control unit 2 on port 4 on the module in slot 5 of the platinum node.
3. An example of addressing for a *SAMML* module is shown below:

platinum:5.4/1.3	is the address of port 3 on board 1 of a SAM that is connected to link port 4 of a SAMML in slot 5 of the platinum node.
4. An example of addressing for an M1 Frame Relay module is shown below:

platinum:5.2.16	is the address of DLCI 16 of port 2 on the module in slot 5 of the platinum node.
5. Examples of addressing for an M2 Frame Relay module are shown below:

platinum:6.1	is the address of port 1 on the module on the module in slot 6 of the platinum node.
platinum:6.1/0.20	is the address of virtual port 20 on port 1 on the module in slot 6 of the platinum node.
platinum:6.1/0.20.35	is the address of DLCI 35 of virtual port 20 on port 1 on the module in slot 6 of the platinum node.

Wild Cards

You can use the database's ability to do pattern matching with special characters called *wild cards* or *character substitution*.

The following wild card characters can be used to simplify network addressing used in the alarm system. Note that the characters used with wild carding must be enclosed in double quotation marks if entered on the command line.

"*" matches zero or more characters. Suppose there are six nodes named: *yours*, *yournode1*, *yournode2*, *yournode3*, *yourdkn1*, and *yourdkn2*.

"your*" matches all six nodes.

"yours*" only matches the node named *yours*.

"yournode*" matches *yournode1*, *yournode2*, and *yournode3*.

"?" matches any single character

"[...]" matches any enclosed character, including character ranges as in [a-z]. For example, *yournode[1-3]* matches *yournode1*, *yournode2*, and *yournode3*. A caret (^) as the first character in the brackets, matches any character *not* listed. For example, *[^y]** will not match *yours* or any other node starting with *y*.

"\" escapes or protects the special character that follows it. For example, *\\$* is used to match a literal Dollar sign.

For example: `alhist -l c,ma "east/band/*"`

The example above specifies an alarm history report for critical and major alarms with a netaddr that begins with *east/band*.

Anchors

The alarm system further simplifies the search for alarms with wild cards by permitting an *anchor* to be added to the right of the network address. Anchors use the characters ":" and "/" to limit the search string. Use an anchor when you want to prevent the address from meaning *and all the addressable components beyond this point in the path*. Without an anchor, the expression *yournode1* is the address of all components reached via *yournode1*. However, *yournode1:* limits the address to the node *yournode1* without the node's elements.

In another example, *yournode:5* reaches all the components whose address begins with *yournode:5* while *yournode:5/* reaches only the module in slot 5 of *yournode* and not beyond.

This concept is illustrated in the following two examples.

```
alhist -l cr,ma east/band/yournode:5
alhist -l cr,ma east/band/yournode:5/
```

Anchors become even more versatile when they are used jointly with wild cards. For instance, *yournode** is the address of all elements reached via the nodes whose names start with *yournode*. Therefore, *yournode** addresses all the elements connected to the nodes *yournode1*, *yournode2* and *yournode3* and so on. However, *yournode**: limits the address to the nodes without their elements. In our example, this means the nodes *yournode1*, *yournode2*, and *yournode3*, without their elements. Limiting the addressing to node level permits you to address alarms occurring at node level, such as cabinet and shelf-related alarms.

Node Name Expansion

Some of the commands in this document such as **alarmhistory**, **alarmstatus**, and **clear** use a feature called *node name expansion*. This means that a portion of an address can be entered instead of the entire four level address as long as that portion is unique to the network. For example, if the address of a node is *national/east/garden/gold* a user would just be required to enter *gold*, as long as another *network/area/exchange* does not have a node named *gold*.

Backup/Recovery Hardware Options

Beginning with R8.0, *StarKeeper* II NMS can be configured on a 2-GB disk. This lets you collect and store much more data than in previous releases. Three different hardware options are available with the **skbackup/skrestore** commands: regular tape drive (R), fast tape drive (F), and disk-to-disk (D).

Data back-up is an essential element of network management operations, therefore, you should be aware of the implications of the increased data capacity on your backup strategies. The major implication is on the time it takes to do the backup, which depends on the amount of data to be backed-up and the speed of the devices used for backup.

Unless you are using the **-e** option, the **-n** option, or the **-c** and **-f** options together, *StarKeeper* II NMS must be shut down during backup operations. (See **Chapter 7** for additional information about these options.) During shut down, *StarKeeper* II NMS does not collect data from the nodes it is monitoring; that is, no alarms, or billing or performance data are collected. With the new hardware options for **skbackup**, control of this downtime is available

⇒ NOTE:

The **skbackup** command enables you to back up the configuration database while *StarKeeper* II NMS is up and running. However, **skbackup** should not be run with the **-c** and **-f** (force) options when updates to the configuration database are being applied via **cfg_sync**, the **cf** commands, or Network Builder application configuration forms.

Data usage varies, so you must determine what kind of backup interval your configuration requires. If you are planning to acquire a new *StarKeeper* II NMS Core System, you must estimate the backup interval for the new system as well. The paragraphs below discuss methods which can help you assess which backup approach is best for your situation.

The choice of data transfer rate is dependent on hardware. If you do not need a higher speed option, you can continue to use **skbackup** as in the past.

Regular Tape Drive (R Option)

The standard operating environment for a *StarKeeper* II NMS Core System has a regular tape drive rated by HP at a typical transfer rate of approximately 660 MB/hour under steady-state conditions. This means, for example, to back up 1-GB of data, your *StarKeeper* II NMS would be shut down for about an 1-1/2 hours. If the entire 2-GB */usr2* disk is filled, it would take between 2-1/2 and 3 hours.

Fast Tape Drive (F Option)

The fast tape drive option offers a significant increase in the speed of data transfer. This option uses a tape drive that operates at a rated speed of 2.45 GB/hour. This new tape drive is an 8.0-GB 4mm DDS-2 format tape drive (HP product number C2983A).

If you are using a C200 system, it is equipped with an internal 12-24 GB 4mm DDS-3 format tape drive, so an additional tape drive is not needed.

2-GB External Hard Disk (D Option)

The disk-to-disk (D) option uses a 2-GB external hard disk; if you choose to acquire and configure this external hard disk, you can first execute the backup to the hard disk from your *StarKeeper II* NMS Core System database and then transfer the data from the external hard disk to removable media. The second transfer step does not involve any *StarKeeper II* NMS downtime, you can use either the standard tape drive or the higher speed tape drive. The transfer rate for disk-to-disk copying is approximately twice as fast as the fast tape option.

Using Core System Commands

2

This chapter provides an overview of how to use *StarKeeper II* NMS commands. In addition, it discusses *StarKeeper II* NMS menus and how to issue commands using these menus. It explains how to get help, and briefly touches on alarm messages and addressing.

Commands

StarKeeper II NMS commands allow the System Administrator to monitor network operation, maintain the network, collect data, and generate performance, billing, and alarm reports. Commands are the vehicles by which the Administrator manages the network.

The *StarKeeper II* NMS Administrator/user can access commands to control and manage network functions. The commands at your disposal include the commands that are part of *StarKeeper II* NMS, as well as the commands developed for your node and Operating System (OS) commands. A command overview is presented in **Appendix F** for quick reference. For a detailed description of each command, refer to the list of sources outlined in the table below:

Command Set	Applicable Source
<i>StarKeeper II</i> NMS Commands	<i>On-Line Help (help [-r] <command>)</i>
BNS-2000 Commands	<i>DNP Commands Reference</i>
BNS-2000 VCS Commands	<i>DNP Commands Reference</i>
UNIX System Commands	<i>UNIX User Reference Manual</i>
HP-UX Commands	<i>HP-UX Reference, Volumes 1 through 3</i>

In addition to existing commands, you can write your own customized commands using OS shell scripts, which are files created using an editor (**ed**, **vi**). These files consist of commands normally entered on the command line. You must be familiar with OS shell programming to write scripts. When creating customized commands, do not give them the same name as an OS, *StarKeeper* II NMS, or network command. To verify if a command name already exists, use the OS **type** command on the command line:

type <commandname>

The system informs you if a command by that name already exists.

StarKeeper II NMS commands are issued using vertical choice menus, ring menus, prompted-line, or one-line methods, as discussed later in this chapter. Some commands can only be issued one way while others are accessible by more than one way.

NOTE:

Some terminals use a key instead of the key to execute an entry. Use whichever key is appropriate to the workstation.

Most commands produce system responses. System responses are messages returned to the terminal to provide the user with information requested by the command, or a prompting sequence, or reporting an error in user input. System responses can be from one line of text to many pages. If the command you enter produces a system response with more lines of text than can fit on the screen, “pipe” the command output to the OS **pg** command and page through the system response, one page at a time, by pressing . For example, enter **connections | pg** to view the output of the **connections** command one page at a time.

The *StarKeeper* II NMS Administrator logs onto the system using the *cnmsadm* login; this produces the SK: prompt. Most of the commands discussed in this guide are available to the *cnmsadm* login from the SK: prompt (some require you to change to the root directory and become the superuser); other logins have access only to those commands granted to the user.

Keyboard Idiosyncrasies

In some situations, the  or  key will not interrupt an application. If your keyboard has a  key or a  key, you can press   or   to interrupt an application. Regardless of the situation or the keyboard you are using, you will always be able to interrupt an application by pressing  .

Command Format

The following shows the format of a typical *StarKeeper II* NMS one-line command. Explanations of the format variations follow.

command_name [-I] <netaddr> -n <node_name> [-s <system_type>]

Where:

- Items enclosed within brackets such as [-I] are optional fields.
- Items within greater/less-than symbols, such as <netaddr> are mandatory fields in which you enter a variable.
- Fields such as -n <node_name> are mandatory fields that require an argument.

For example, -n node1

- Fields such as [-s <system_type>] are optional fields that require a variable.

For example, -s dkii

- For **prompted** entry commands, default values are indicated by a plus sign (+) before the value that is the default.

For example, REPORT OUTPUT [printer, screen: +(screen)]:

Command Conventions

The following conventions apply when entering *StarKeeper II* NMS commands:

1. Some commands can be abbreviated by the first letter of the command, followed by the minimal set of letters necessary to distinguish it from another command.

For example, for the **cfverify** command you can enter cfv.

2. When arguments are used with commands, for example, `-n <node_name>`, the following are true:

- The space between the option and the value may be omitted. Either one of the following formats are acceptable:

For example, `-n node1` or `-nnode1`

⇒ NOTE:

When using **cf** commands, the space between the option and the value is required.

- A "-" within the option indicates a range of values. The following illustrates a time interval from 10:15 am to 2:30 pm.

For example, `10:15-14:30`

- A "," indicates a series of values. The following illustrates how critical, major, and minor alarms are entered on a command line.

For example, `c,ma,mi`

A space cannot follow a comma in a series of values.

3. Some commands have **one-line** and **prompted** modes of entry. Some commands such as **alarm_ui**, **cf** and **SKsh** have a menu-driven forms type of entry complete with help screens and help windows for ease of use.

Types of Menus

The following sections discuss menu types and characteristics.

Ring Menu

A ring menu is a horizontal display of choices the screen, with an associated text line below the choices that describes each choice. To make a selection, either enter the first letter of any choice or move the highlight bar from choice to choice. This is done by pressing `Space`, `Backspace`, or directional keys (that is, arrows, `Ctrl j`, or `Ctrl k`). Once the highlight bar is positioned on the desired choice, press `Enter` to activate the selection. To exit from a ring menu, press `Delete`. This causes the previous ring menu to be displayed. If the first ring menu is displayed, press `Delete` to display the Confirmation Ring Menu. This is illustrated in the following screen.

CONFIRM EXIT: Yes No

Choosing **yes** causes an exit from the application. Choosing **no** displays the previous ring menu.

Vertical Choice Menu

A choice menu is a window area where a list of choice menu items is presented on multiple lines. If a field has a choice menu, the menu is invoked by pressing **Ctrl** **v**. A highlight bar is positioned on the current choice. A choice menu can list up to 10 items at one time. When there are more than 10 items in a choice menu, you see the message -More- in reverse video on the last line of the list, indicating that there are more choices available. Pressing any key moves down through the list while pressing **Ctrl** **k** or **↑** moves backwards through the list. When the highlight bar is on the last choice of the window, pressing any key causes the entire list to scroll up one line. If this was the last choice item of the list, the list is displayed again and the highlight bar is placed on the first choice item of the list. Similarly, if the highlight bar is at the top of the window and **↑** is pressed, the entire list is scrolled down one line. If the highlight bar is positioned on the first choice item, an error message indicating this is displayed. To select a choice item, press **Ctrl** **t** when the highlight bar is under the item you desire. This selects the item, clears the choice menu window, and displays the form again. The selected choice item is then entered into the current field on the form. When you press **Delete**, you exit from the choice menu without selecting an item.

General Menu Characteristics

- **Reverse Video.** All fields are displayed in reverse video without delimiters around them. When a menu choice (see previous sections on ring menus and vertical choice menus) is in reverse video, it is the current choice. The reverse video area is then referred to as the **highlight bar**.
- **Status Message.** A status message indicates the status of an operation. For example, when a node is added to the database, the message **Node has been added** is displayed. If a trunk or a concentrator was added, the word **Node** would be replaced by **Trunk** or **Concentrator** respectively. A status message is displayed in reverse video on line 24 of the screen accompanied by the sound of a bell.
- **Error Message.** An error message indicates either an invalid entry, an illegal action, or a system failure. The error message is displayed in reverse video on line 24 of the screen and is accompanied by the sound of a bell. If you aborted the form or there was a system failure, the cursor exits the form and returns to the most recent menu. However, if there was an illegal action or a validity check failed, the cursor remains in the form.
- **Dynamic Field Labels.** Some fields do not have labels at the time the form is first displayed. These labels are variable and are dependent on the contents of other fields. Based on the contents of the labeled fields, the appropriate dynamic label is generated and displayed. If a dynamic label is not displayed, the cursor does not enter its corresponding field. However, when certain specific fields are entered, it is determined which dynamic labels appear. The field corresponding to a dynamic label is called a *dynamic field*.

- **Exit Key.** When Delete is pressed while in a form, the operation is aborted. An operation is one of the following: add, change, delete or verify. If Delete is pressed while the cursor is on a ring menu, the previous ring menu is displayed. If this was the first ring menu of the application, the application is exited after the intention to exit is confirmed. Pressing Ctrl **z** anywhere in the application causes an exit from the application, except in the connection class window and in the connection class section of the node form.



NOTE:

Refer to the section **Keyboard Idiosyncrasies** earlier in this chapter for more information on the Delete key.

- **Validation.** When you press Ctrl **g**, at the conclusion of data entry, full screen or record validation is performed. When an error condition is found, a message is displayed and the cursor placed in the offending field. This form of validation permits you to enter invalid data in a field during the screen fill-up phase. However, after all the data is entered, you are notified of any errors.

The Menu Hierarchy

Many, but not all, *StarKeeper* II NMS commands are available through the *StarKeeper* II NMS menu system. To use the menu system you start at the Main Menu (Level 1), which you access by entering **SKsh** at the SK: prompt. (For this reason, the menu system is often referred to as the **SKsh** menu system.) The Main Menu (also known as the Begin Menu) gives you access to five major areas of the *StarKeeper* II NMS. (Instructions for making choices and entering commands from menus are covered later in this chapter.)

The five choices on the Main Menu are:

SYSADM	System Management	(calls a vertical choice menu)
ALRMADM	Alarm Conditioning	(calls a ring menu)
CFCOMMAN	Network Configuration	(calls a ring menu)
UPDNLD	Node Upload and Download	(calls a vertical choice menu)
BDTMGMT	Billing Day/Year Table Management	(calls a ring menu)
NDSWMGMT	Node Software Management	(calls a vertical choice menu)

After making your choice, the next menu is invoked. If the next menu is a Level 2 menu, you choose the command to enter, which puts you into an interactive mode in which the system will ask you for information to execute the command properly; or, you invoke a Level 3 menu where you choose the command to enter. If the next menu is a ring menu, you choose a category and an operation before being put into the interactive mode. This relationship of menus is called the menu hierarchy, and is illustrated in Figure 2-1.

On vertical choice menus, if you press without making a selection, line 23 of the display will ask if you want to return to the previous menu (level). Press again if you want to return, or press any other key if you want to remain in the menu to make a selection. To exit ring menus and return to the previous level, press , or press **z** to return to the Main Menu.

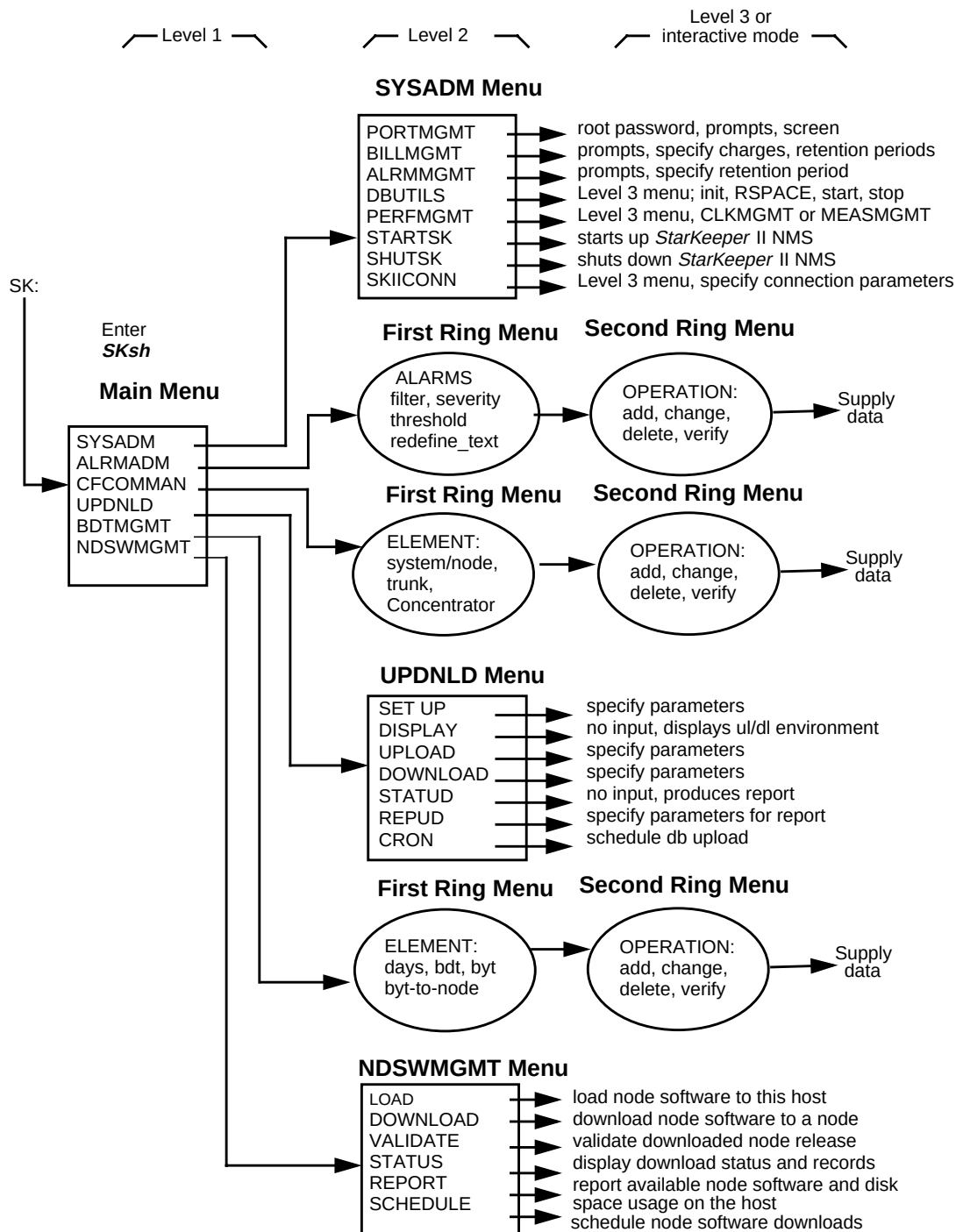


Figure 2-1. The Menu Hierarchy

Issuing Commands Using Vertical Choice Menus

To access the Main Menu, enter **SKsh** at the SK: prompt and the menu shown in Screen 2-1 appears.

StarKeeper (R) II Network Management System - Selection Menu			
Select	Description	Menu: Begin	Level: 1
	***** Welcome to the StarKeeper II NMS Menu System **		
SYSADM	StarKeeper II NMS Management Utilities Menu		
ALRMADM	Alarm Conditioning Utilities Menu		
CFCOMMAN	Configuration Commands		
UPDNLD	Node Upload and Download		
BDTMGMT	Billing Day/Year Table Management		
NDSWGMT	Node Software Management		
Enter a selection (or ?selection for help) and press RETURN			

Screen 2-1. StarKeeper II NMS Main (Begin) Menu

To choose a menu selection, you must give enough information to establish and move a *highlight bar* to your menu choice. ("Highlight bar" is the reverse video technique that some terminals offer for the underbar.) You could type the entire name; for example, you could enter **alrmadm** at the Main Menu to choose **ALRMADM**. However, *StarKeeper II NMS* menus recognize a minimum entry for positioning the highlight bar. As soon as you type the **a** in **alrmadm** the highlight bar appears on the **ALRMADM** selection. If there is more than one choice on a menu having the same first letter, the highlight bar goes to the first choice with the common letter when you enter it. For example, on the **SYSADM** Menu, three choices start with the letter "s": **STARTSK**, **SHUTSK**, and **SKIICONN**. When you type an **s**, the highlight bar goes to the first word starting with **s**, which is **STARTSK**. If you want to move the cursor from **STARTSK** to **SHUTSK**, type in the second letter in the word, which is **h**. As you can see, the menu system uses the minimum amount of keystrokes to move the cursor and identify your choice for entry. Remember, the entry does not take effect until you press .

When you first enter a vertical choice menu, there is no highlight bar; if you press without specifying a choice, the menu system will ask if you would like to return to the previous menu. The default choice is *yes* for all choice entry menus. Press again for *yes*, or press **n** for *no*.

Issuing Commands at the Ring Menus

Where appropriate, categories of objects and the operations that are to be done on them are chosen at *ring menus*. Choices are made by moving the highlight bar to the item you want and pressing . Use the spacebar to move the highlight bar to the right, use to move the highlight bar to the left, or enter the first letter of the choice you want to make. A sample ring menu is shown in Screen 2-2.

```
NETWORK ELEMENTS: System/Node Trunk Concentrator Help
** one-line message appears here **
```

Screen 2-2. Sample Ring Menu

Use the special keys listed in Table 2-1 to move around ring menus, make or change choices, enter choices, and exit the menu.

Table 2-1. Special Keys for Use with Ring Menus

Key	Operation
Ctrl-j Ctrl-l Down Arrow Right Arrow Spacebar	Next menu choice
Backspace Ctrl-h Ctrl-k Left Arrow Up Arrow	Previous menu choice
Ctrl-o	Request help
Ctrl-t	Select help type (application or key)
Ctrl-z	Exit the application from any point
Delete	Exit current activity (and return to previous ring menu)
Enter	Make choice at highlight bar

NOTE:

Refer to the section **Keyboard Idiosyncrasies** earlier in this chapter for more information on the key.

Entering Data on Database Records

When you enter a record, the cursor appears at the first field in which entry is required. If you make an error, use **Backspace** and re-enter. When you are finished with the field, press **Enter** to advance to the next field. If you want to quit the session before finishing and not have the database receive the data, press **Delete**. When you are finished entering data, press **Ctrl g** to add the data to the database or to start the search and verify process.

Use the special keys shown in Table 2-2 to move around database records, make or change choices, enter choices, and exit the menu.

Table 2-2. Special Keys for Use with Database Records

Key	Operation
Ctrl-I Spacebar	One space to the right within a field
Right Arrow	One space to the right within a field, then to next field when at the extreme right position of a field
Backspace Ctrl-h	One space to the left within a field
Left Arrow	One space to the left within a field, then to previous field when at the extreme left position of a field
Ctrl-j Down Arrow Return	Next field
Ctrl-k Up Arrow	Previous field
Ctrl-o	Request help
Ctrl-t	Select help type (application or key), Call up Connection Class details form (configuration records)
Delete	Exit current activity (and return to previous ring menu)
Ctrl-z	Exit the application from any point
Ctrl-g	Initiate search for data, Activate addition/changes, Move to Connection Class form (configuration records)



NOTE:

Refer to the section **Keyboard Idiosyncrasies** earlier in this chapter for more information on the **Delete** key.

Issuing Commands from the Command Line

Where available, the one-line and prompted-entry methods of entering commands are often preferred by experienced administrators/operators. Using either method bypasses all menus, as the entire command, complete with all necessary information, is entered at the shell prompt and executed by pressing .

One-line Commands

In using the one-line command entry method, all command information is entered at once, typically with no further interaction needed to execute the command. One-line commands include an action verb, like **enter**, **change**, **delete**; an object of the action, like **node** or **trunk**; and any arguments (options) that may be required; for example:

***cfverify trunk -T all
skrestore -l***

If you are at the SK: prompt (the *cnmsadm* login), you have access to all *StarKeeper II* NMS commands, although some commands also require that you log in as **root**. If you are at a login other than **cnmsadm** you have access to those commands that the Administrator permitted (through use of the **Permit** command). See the **Command Partitioning** section in **Chapter 3** for a complete discussion. You can then enter a standard command (or, in some instances, an acceptable abbreviation) at the keyboard. The command is echoed to the screen. An example is shown in Screen 2-3.

```
SK: cfenter node -n west/garden/gold -s DKII -r 3.0 -cm h -cd goldb -cs a -cp 0
```

Screen 2-3. Sample One-line Command with Arguments

When you enter commands, keep in mind the following rules and suggestions:

- *Be careful with uppercase and lowercase letters.* The system distinguishes between uppercase and lowercase letters; they are not interchangeable. Enter command lines exactly as shown in the supporting documentation.
- *Use abbreviations to speed your tasks.* For some commands, the system accepts a *unique* truncation for the command. It accepts, for example, **cfe**, **cfen**, **cfent**, or **cfente** for **cfenter**.
- *Separate elements of a command entry with spaces.* For example, **enter<spacebar>group**. (The system ignores extra spaces.)
- *Press after typing each command.* An executes the command.

Prompted Entry Commands

For some commands (like **report**) the system requires more information, so it supplies a secondary prompt or series of secondary prompts requesting that you set values for the command's parameters. You must then enter these values, responding to each parameter prompt before going on to the next prompt.

Screen 2-4 gives an example of secondary prompts and an Administrator's entries. The secondary prompts vary according to the command and how you responded to previous secondary prompts.

Most secondary prompts include [] (brackets) that contain your possible responses, a range of possible responses, or the format your response must take. Some possible responses are system defaults; these appear in parentheses preceded by a plus sign.

```
SK: report
REPORT TYPE [ alarm, billing, performance ]: p
NODE TYPE [ BNS-1000, BNS-2000, Datakit, DKII, ISN, network ]: dkii
REPORT NAME [ bisync, concentrator, cpmml, dkap, host, node, sam, samml,
              sdlc8, trkgrp, trunk, tsm8, x25, x75: +(bisync) ]:
```

Screen 2-4. Command Specification, Prompted Mode

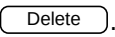
When you specify command parameters, keep in mind the following:

- Select defaults by pressing .
- Use the special editing keys on the keyboard. See **Editing Command Lines**, including Table 2-3.

Issuing Node Commands

The *StarKeeper* II NMS Administrator can send operational node commands to any monitored node from the *StarKeeper* II NMS console. The *pass-through* feature provides the capability to send and execute the commands. Also, the subsequent *StarKeeper* II NMS **setnode** command, once entered, allows all commands to be directed to the specified node until an **exit** command is entered.

Pass-through of Node Commands

Pass-through commands access a monitored node and the commands are executed just as though the Administrator had direct access to the node. They are executed by specifying the node name (**-n** option) on the command line with the regular command or by specifying the node via **setnode**. To terminate a pass-through command before it completes, press .

For example, if you were the node Administrator and your node console was connected directly to a node called *platinum*, and you wanted to verify the module in slot 25, you would enter the node command **verify module 25** on the command line (at the node prompt). You can accomplish the same from the *StarKeeper II* NMS console by entering the following:

verify -n national/west/957/platinum module 25

The default timeout interval for pass-through commands is 120 seconds. Some pass-through commands may take longer to execute and will get timed out. When this happens, the following message is displayed:

SCP has detected an error in communication with doorway. Could not send the disconnect requests.

Change the timeout interval. To change it, use the **-I** option on the command line to select 400 seconds or use the **-L** option to specify (in seconds) your own timeout interval (up to 600 seconds). The following example shows a pass-through command with a timeout interval specified as 600 seconds:

dkbackup -L 600 -n silver tape 0

NOTE:

MRC commands cannot be issued using the pass-through feature; use the **console** command (see **Chapter 3**).

The following two special *StarKeeper II* NMS commands are also node pass-through commands:

dkhelp displays the node versions of **help** for commands accessed through *StarKeeper II* NMS

dkset allows the *StarKeeper* Administrator to access the node's **set** command

A special case of the **diagnose** command for FRM is available for *StarKeeper II* NMS. The **nping** command (based on *StarKeeper* **sequence** command) formulates a dialog with the node to perform the nping option of the node's **diagnose** command. Run **help** for a brief description of this command.

Output from pass-through commands are stored in the **\$CONSLOG**.

Session Maintenance Commands

The node Session Maintenance feature is supported by two *StarKeeper II* NMS commands that communicate with the node:

smverify displays the Session Maintenance reroute data for a node associated with a particular neighbor node or all the neighbor nodes.

smstat displays the status for Session Maintenance operations with all current reroutes in which a specified node is participating.

The format for the **smverify** and **smstat** commands is shown in the examples below. The **-n** option specifies the node name for both commands. The **-a** option is required for the **smverify** command to specify the neighbor node name:

```
smverify -n silver -a gold  
smstat -n silver
```

Displays for **smverify** and **smstat** are also stored in Log Files (the *\$SMLOG*).

SMDS Measurements Command

The **smdsmeas** (also called **smeas**) command displays measurements information for T3 trunks, AI and GAR modules. The output from the command is stored in the directory *\$ADMINLOG*. Refer to the BNS-2000 or Data Networking Products documents for more information on this command.

The **tmeas** command is used to display measurement data for high speed trunk modules.

Issuing a Series of Network Commands to a Node

If you are going to issue a series of commands to a network node, you can use the **setnode** command to specify the node that is to receive all subsequent network commands until you enter an **exit** command or press Ctrl **d**.

Use **setnode <nodename>** to direct all further commands to the specified node. For example, if you enter **setnode national/west/garden/gold**, the gold node returns its prompt and all further commands are sent to national/west/garden/gold. **setnode** also supports X.121 four-level addressing. Refer to the **X.121 Addressing** section in **Chapter 1** for a description.

Editing Command Lines

As shown in the table below, special keys on your keyboard can be used during command entry. These keys work in any entry mode.

Table 2-3. Editing Key Functions

Function	Editing Key
Erase a character	Backspace
Delete an entry, abort a command, exit a command mode, or quit a long report. Refer to the section Keyboard Idiosyncrasies earlier in this chapter for more information on the  key.	Delete
Execute a command; in prompted entry mode, enter a line	Return
To break a long character string across more than one line use the backslash to ignore a line end; it also removes special significance of any editing character it precedes	\
Words typed between quotation marks are to be treated as one string of characters	" "
A comma is placed after each item in a sequence; for example, 1,3,8,9	,
A hyphen shows a range; for example, 1-9	-

Getting Help

Help is available right at your fingertips. You can get help at your system prompt by entering help commands. Help is also built into menus to assist in making selections, and is available from your phone by calling your appropriate support organization.

On-line Help While at a System Prompt

The on-line help facility can provide you with a full-screen detailed explanation of all *StarKeeper II* NMS commands, alarms, and messages. On-line help is available for the following:

- alarms and error messages
- available commands
- node commands
- *StarKeeper II* NMS Core System commands
- Partitioned User commands

To get help, enter the **help** command at the system prompt. To print out all the command files enter the following command:

help -p cmds_ref

For Full-Screen Help on a Command

As an example, if you want full-screen help on the **help** command, enter ***help help***.

SK: **help help**

The system displays the following full-screen message (Screen 2-5):

```

--help--
The help command is used to provide user information on a particular
StarKeeper II NMS or node command, alarm, or message. The options are
as follows:

help                displays a list of the available commands
help [command_name] displays complete information for a specific command
help -r [command_name] displays system responses for a specific command
help -R [command_name] displays complete information and corresponding
                        system responses for a specific command
help [alarm/message_ID] displays information about the specified alarm or
                        message

Additionally, a -p option can be added to the above commands to print out
the help information on a printer. A printer name will be prompted. When the
-p option is used with the keyword 'cmds_ref', instead of a specific command
name, help information for all the StarKeeper II NMS network administration
commands will be printed out on the printer specified.

-FORMAT-----
help [-p] [-r command_name] | -R command_name | command_name |
                        alarm/message_ID |cmds_ref]
-VARIABLE FIELDS-----
-p: Prints the information on a printer instead.
-r: Displays a listing and explanation of the system responses associated
    with a command.
-R: Displays complete information associated with a command including
    a listing and explanation of system responses.
cmds_ref: Prints out help information for all the StarKeeper II NMS
    network administration commands.
[command_name]: The name of the command for which information is to be
    displayed.
[alarm/message_ID]: An alphanumeric string identifying the alarm or message
    id for which information is to be displayed.
-EXAMPLES-----
help
help alstat
help -p cfg_sync
help -r cf
help -R sni_sync
help -p -R sni_sync
help 1001
help -p 30039

```

Screen 2-5. Example of Full-Screen Help

⇒ NOTE:

If the help message is more than the full screen, there is a colon at the bottom of the screen next to your cursor. When you are ready to read more, just press . If you have read enough and do not want to continue, press **q** (quit).

For Full-Screen Help on an Alarm or Message

As an example, if you want full screen help on alarm 1023, enter the following at the SK: prompt:

```
SK:  help 1023
```

The system responds with a full-page display, such as the following:

```

--ALARM INFORMATION--
-ID-----ALARM/MESSAGE-----
1023          REPORT ALARM: More than 1 active controller
              Rec act: Disable all but one of them and reboot that one
-EXPLANATION-----
Both Control Computers with which this node is equipped are currently enabled.
Only one Control Computer should be enabled at any one time; the other is a
standby.
-RECOMMENDED ACTION-----
Set the MODE switch on the standby Control Computer to Disab and check to
make sure that the active Control Computer mode switch is set to Enabl.

Enter "initialize controller" to reboot the Control Computer.

The Node Reference provides additional Control Computer switchover information.
```

For Help on Node Commands

Use **dkhelp** to get help on node commands. Enter **help dkhelp** for instructions on using this command. The format is:

```
dkhelp -n <nodename> <commandname> <object>
```

On-line Help for Menus and Records

On-line help is available for choice menus, ring menus, and database forms, as described in the following subsections.

For Choice Menus

Line 23 on choice menus instructs you to enter **?<selection>** for help on a possible menu selection. For example, if you are at the Main Menu and you want information on the CFCCOMMAN selection, you would enter **?c**. The **c** in this instance is enough to identify the CFCCOMMAN entry. The screen then displays a full page (or more) of help information. Press to page through the help and return to the menu, or press at any time to return to the menu.

For Ring Menus

The second line of a ring menu is a help message that describes the current choice as shown by the highlight bar. Also, a choice on each ring menu is **Help**. If you use the space bar to move to Help and press , a help window appears in the upper right-hand corner of the screen specifying Application help and Key help. Press to toggle between the two choices; when the highlight bar is on the type of help you want, press **t** to get a full screen of help. Press to page through the help and return to the ring menu.

You also can call the help window by pressing **o** at any time the ring menu sits atop the record that was called to the screen. If **o** does not work, you must exit the record to obtain the desired help information.

For Records

On some forms, there is not enough room to display the full set of valid entries on the help line. A message appears on line 23 of the record stating: To display a choice menu, type Ctrl-v. Follow those instructions if you want help. If pressing **v** does not work, you must exit the record to obtain the desired help information.

System Responses

System responses are messages returned to the terminal to provide the user with information regarding a particular situation. These messages are either of an informational nature, or are in response to an error in user input. A list of **SYSTEM RESPONSES** for a command can be obtained by executing the **help** command with the **-r** or **-R** options on the command line.

Alarm Messages

Alarm messages are messages sent to the user's terminal by the system in response to a user turning on alarms via the **alarms** command or the **netdisp** command. Detailed information about alarms is presented in **Chapter 5**.

To obtain more information regarding an alarm message, use the **help** command in the following manner:

SK: **help <message_number>**

⇒ NOTE:

If the user requests a help file with a message number that contains a B suffix (for example, 1001B) and it does not exist, the user will be shown the contents of the help file without the B suffix (for example, 1001) if the file exists. The information pertains to the alarm number with a B suffix as well as the number without it.

The following is an example of the output that is displayed for a typical **help** command:

SK: **help 1053**

```

--ALARM INFORMATION--
-ID-----ALARM/MESSAGE-----
1053    REPORT ALARM: Phase Lock Synchronization error CAB=<cab> SLOT=<slot>
-EXPLANATION-----
The receiver on the TRKHS or T1 Trunk module is having difficulty synchronizing
itself with the transmitter on the other side of the trunk line. When
synchronization is lost, the module continually tries to reset itself (phase lock
loop).

If the node was configured with "AUTOMATICALLY REMOVE TRUNK WITH ERRORS?" set to
'yes', then when the requested number of error packets has been reached, this
alarm will be followed by REPORT STATUS: config: remove module <slot>

CAB <cab> is a decimal number that identifies the cabinet number involved. <cab>
ranges from 0 to the number of cabinets in the configuration minus 1. Cabinet 0
always contains the SWITCH module.

SLOT <slot> is a decimal number that identifies the shelf slot occupied by the
affected module.
-RECOMMENDED ACTION-----
  1. Check the SYNCHRO PROBLEM field of the 'dstat' command to see how many status
  packets have indicated a synchronization problem.
  2. Check the connection between the fiber and the local TRKHS module's paddle
  board, or the T1 connector cable and the local T1 module's paddle board.
  3. Try replacing the local trunk module, the remote trunk module and the fiber or
  the T1 connector cable, each in succession, until the problem is resolved.
```

For detailed information about alarms, see **Chapter 5**.

The system administrator has duties to perform at all times; some are done at installation, some during the on-going operation of the *StarKeeper II* NMS, and some during maintenance procedures. Also, some tasks are done only once and others are done on a continuing basis.

The first system administration duty, after installation is complete, is to establish and administer connections from *StarKeeper II* NMS to each node in your network. Network nodes can be connected to *StarKeeper II* NMS via a host connection. Connections can be of eight different classes: console, billing, performance, administration, Maintenance Redundancy & Control (MRC), dial backup, alarms, and *StarKeeper II* NMS. These connections are summarized in Table 3-1.

**NOTE:**

BNS-2000 and BNS-2000 VCS systems function with Maintenance and Redundancy Control (MRC). CCM and ECPU systems perform this function with different modules. CCM systems function with an MRC. ECPU systems function with an MRCM. Both modules and the function they perform are collectively referred to as the *MRC* or *MRC function*.

Administration procedures vary for each class. The following sections describe the administration procedures required for host connections, which includes collecting billing data from multiple nodes in the same exchange, and setting the active alarm variable for nodes having an Alarm Activator Unit.

Once the connections are established, many of the system administration duties are performed using the SYSADM menu of **SKsh**; these tasks are listed below. Refer to the section titled **Using the Sysadm Menu** later in this chapter for instructions on using this menu.

- starting up *StarKeeper II* NMS
- shutting down *StarKeeper II* NMS
- port management
- database utilities

- billing management
- alarm management
- performance measurements management
- *StarKeeper II* NMS connections

Additional system administration tasks fill out this chapter:

- node software management
- node database management
- security
- command partitioning
- automating routine tasks
- using the programmer's interface

Establishing Physical Connections

This section explains how to set up a host connection to a node for the purpose of monitoring the node via the connection classes available from *StarKeeper II* NMS. These connection classes are explained in the next section of this guide.

StarKeeper II NMS can manage various networks and collect different types of data. The result is that proper *StarKeeper II* NMS hardware installation and cabling varies with the situation. This chapter assists you in selecting the right cables and guides you through the steps required to connect *StarKeeper II* NMS to a network node.

⇒ NOTE:

It is extremely important that you obtain the connections worksheets that were completed during the planning phase of network configuration. You will need to reference the connections worksheets for specific information as you complete the instructions in the procedures that follow. These worksheets are provided in the *StarKeeper II NMS Planning Guide*.

Connection information is given in the following sections.

Host Connections (Console, Billing, MRC, Administration, and Performance)

The following discusses procedures for host connections for BNS-2000 and BNS-2000 VCS nodes. One D8AG cable for each console and MRC connection on each node is needed (see Figure 3-1).

Procedure 3-1. HP Host Connection

1. Connect the remote nodes to the hub node via a trunk line.
2. For each console connection on each node, connect a D8AG cable from Port B to a TY module port on the node side.
3. Indicate the TY module and port number on the connections worksheet.
4. For each MRC connection on each node, connect a D8AG cable from Port M of the maintenance board to a TY module port on the node side.
5. Indicate the TY port and module number on the connections worksheet.
6. No additional cabling is necessary for billing, administration, or performance connections.

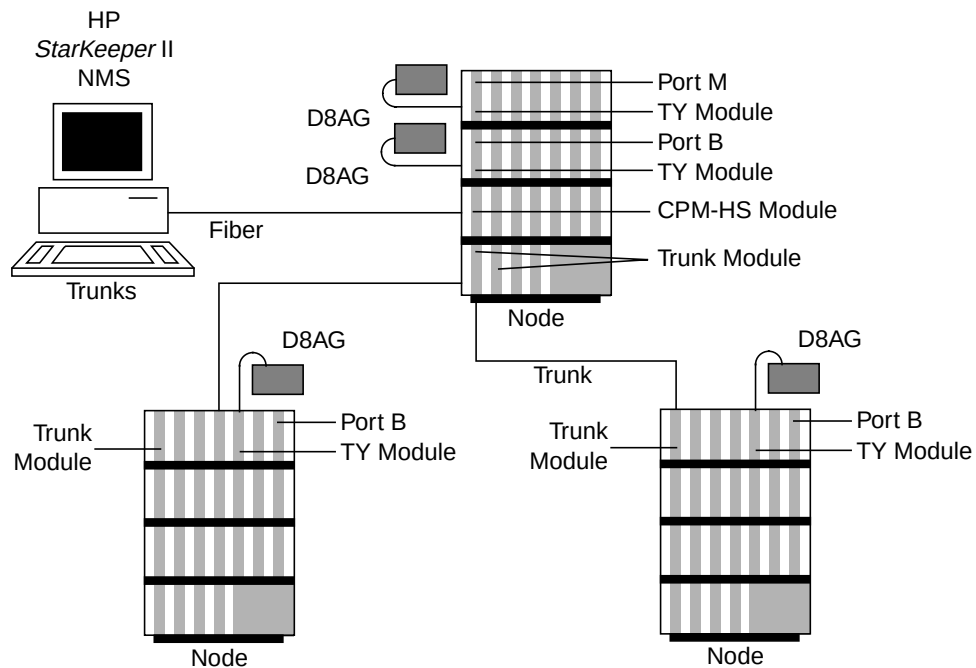


Figure 3-1. HP Host Connection to Network Node

Connecting a Master *StarKeeper* II NMS HP to a Remote *StarKeeper* II NMS

The following sections contain procedures for master/remote *StarKeeper* II NMS host connections. Fiber cables are needed (see Figure 3-2).

Procedure 3-2. Master *StarKeeper* II NMS to Remote *StarKeeper* II NMS - Host Connection

1. For a host connection between a master *StarKeeper* II NMS and remote *StarKeeper* II NMS, connect a fiber optic cable from the multiplexed host interface on the master HP computer to the CPM-HS board on the node.
2. Connect a fiber optic cable from the multiplexed host interface on the remote computer to the CPM-HS board on the node.

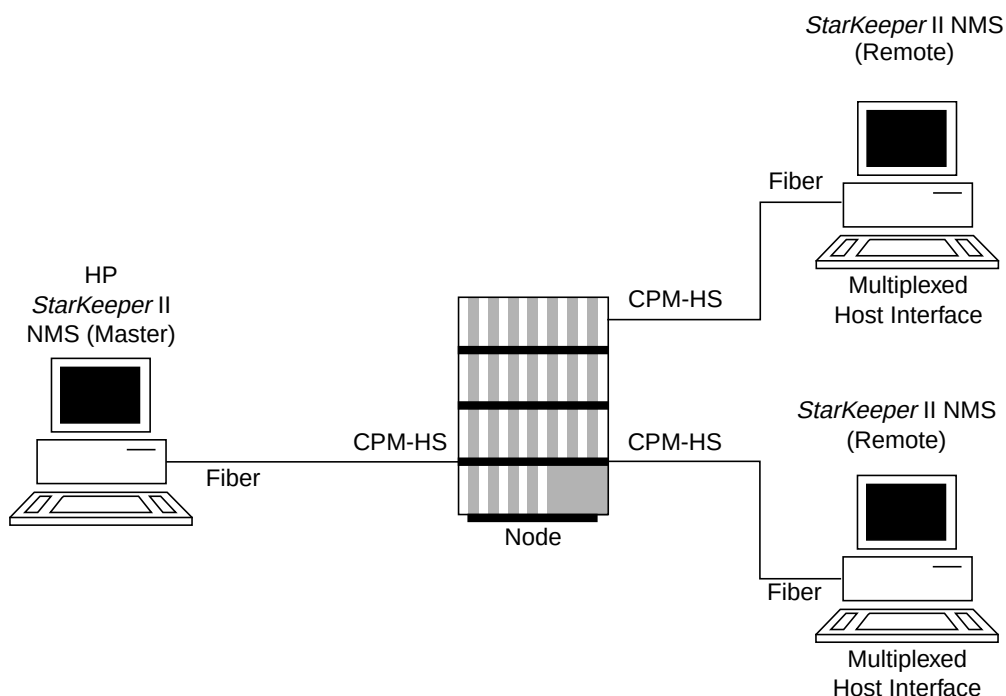


Figure 3-2. Master *StarKeeper* II NMS to Remote *StarKeeper* II NMS - Host Connection

StarKeeper II NMS Connectivity

StarKeeper II NMS has eight possible types of connections, called Connection Classes (see Table 3-1). Each connection is logical and is configured using the methods described in **Chapter 4**; refer to the **Connection Classes** description of the **System/Node and Connections Form**.

Table 3-1. *StarKeeper II NMS Connection Classes*

Type	Description
console	Usage of this connection type depends on the entity that is connected to <i>StarKeeper II NMS</i> . The nodes use this connection more extensively than do other entities for gathering alarms. To collect alarms, the connection status must be set to active. For all system types other than BNS-2000 and BNS-2000 VCS, this connection cannot be made active.
billing	There is one connection to <i>StarKeeper II NMS</i> for each node that reports billing data. See the Billing Management section of this chapter for instructions on entering required billing parameters.
performance	Collects performance measurement data from the nodes. See the Performance Measurements Management section of this chapter for instructions on entering the required data.
administration	(1) Permits the transfer of data from the node to the <i>StarKeeper II NMS</i> database, using Network Builder, skload , and cfg_sync commands. (2) Accommodates the smverify and smstat commands to monitor the Session Maintenance feature available on the nodes. (3) Provides "on demand" measurements for certain modules when requested by the smdsmeas command. (4) Permits the transfer of the Billing Day Tables from <i>StarKeeper II NMS</i> to <i>Datakit II VCS R4.0</i> (or later) nodes and the clock synchronization of these nodes through the ncsbdtd process. The administration connection must be from the same <i>StarKeeper II NMS</i> Core System as the console connection.
MRC	Connects to the M port of the node's MRC. See the MRC Connections section in this chapter.
dial backup	Supports node connections with modems, as a backup to a standard console connection.
alarms	Collects alarms from system elements other than the nodes.
<i>StarKeeper II NMS</i>	Permits the transfer of configuration information between <i>StarKeeper II NMS</i> machines.

Table 3-1 briefly describes the connection types that are available with your *StarKeeper II NMS*. Use the descriptions in this table to help you determine which connections you need to configure to manage your network. These connections may be configured on your Core *StarKeeper II NMS* via the **cf** commands after you have decided which *StarKeeper II NMS* features and graphics application packages you will be using.

The following sections will help you determine which connection classes you will need to support your situation. For a list of all the connections that should be set up for each node, see the Connections Worksheet (provided in the *StarKeeper II NMS Planning Guide*) used during the planning phase of your network installation. For more information about the nodes in your network, see the applicable node manuals.

Choosing Connection Classes for a Core *StarKeeper II* NMS

This section will help you determine which connections you will need to support your Core *StarKeeper II* NMS.

- **Node connections** - The **Console** connection must be configured on Core *StarKeeper II* NMS to connect to the node in order to receive alarms. Also, *StarKeeper II* NMS uses the Console connection for the pass-through feature.

An **Administration** connection must also be configured from the same Core *StarKeeper II* NMS having the **Console** connection to the node to transfer configuration data between *StarKeeper II* NMS and the node. The Administration connection in *StarKeeper II* NMS is used for many different purposes: (a) transferring configuration data to and from the nodes; (b) **smstat** and **smverify** commands for Session Maintenance feature; (c) **smdsmeas** (also known as **smeas**) command for the SMDS measurements feature, (d) the **tmeas** command for the trunk measurement feature; and (e) node clock synchronization and transferring of Billing Day Tables data to *Datakit II* VCS R4.0 (or later) nodes through the **ncsbd** process. This connection must be configured on a *StarKeeper II* NMS core machine in order to synchronize the clock of *Datakit II* VCS nodes and to be able to send Billing Day Tables data to these nodes.

If *StarKeeper II* NMS is monitoring BNS-2000 VCS, it is mandatory to configure the Administration connection in order to synchronize the clocks of these nodes.

StarKeeper II NMS provides an **MRC** connection to the MRC. The MRC connection is used as a backup connection to the B port when the usual **Console** connection to the B port cannot be established. For this reason, the Console and MRC connections can not be active at the same time since they can not be used to access the same B port.

- **Dial Backup connections** - The **Dial Backup** connection is used to establish connectivity, using a modem, to nodes when the standard console connections are not functioning properly.

IMPORTANT

This connection is for emergency purposes only; do not run database load and synchronization commands over this connection.

- **Billing connections** - The **Billing** connection in *StarKeeper II* NMS is used to collect the call accounting data from the nodes. This data is stored in the *StarKeeper II* NMS database and is used for the billing reports provided in *StarKeeper II* NMS. The Billing connection must be configured if you plan to run any billing reports from *StarKeeper II* NMS.
- **Other Element Management Systems connections** - Core *StarKeeper II* NMS also uses the **Console** connection to cut-through to other element management systems it supports. *StarKeeper II* NMS offers a separate **Alarms** connection, which must be configured for collecting alarms from these other element management systems.

Choosing Connection Classes for Graphics and Co-resident Systems

This section will help you determine which connections you will need to support the Graphics System applications offered with *StarKeeper II* NMS.

The *StarKeeper II* NMS Graphics System applications can reside on a Co-resident System or on a Graphics System. A Graphics System must be connected to one or more Core or Co-resident Systems. The following describes the connections needed between the Core System or Co-resident System and the node for each of the Graphics System applications.

- **Network Monitor** - Network Monitor uses the alarm data collected by *StarKeeper II* NMS via the **Console** connection for nodes and the **Alarms** connection for other element management systems. The node and *StarKeeper II* NMS database must also be in synchronization; this is done over the **Administration** connection.
- **Network Builder** - Network Builder uses the **Administration** connection for configuration data transfer between *StarKeeper II* NMS and the node.
- **Performance Reporter** - Performance Reporter uses the performance measurements data collected by *StarKeeper II* NMS via the **Performance** connection. The node and *StarKeeper II* NMS database must also be in synchronization; this is done over the **Administration** connection.

Choosing Connection Classes for *StarKeeper II* NMS

This section will help you determine which connections you will need to support the distributed architecture used with multiple *StarKeeper II* NMSs. *StarKeeper II* NMS offers a distributed architecture that allows you to split your connections either functionally or geographically.

One of these functional splits allows you to have your **Performance** connection to a node on a different Core System than its corresponding **Administrative/Console** connections. When these types of connections to a particular node span more than one Core machine, these machines must be able to communicate with one another. For this reason, you must administer a **StarKeeper II NMS** connection between the two Core machines. This connection class can be configured using the **cf** command and should only be configured from one Core machine. This connection is necessary to run the **sk_sync** command, which updates the Core System monitoring the **Performance** connections with configuration data needed to run performance reports.

Connections to the MRC

An *optional* Maintenance and Redundancy Control (MRC) function provides a multiport interface for maintenance access to the Control Computer of the node. The MRC has three communications ports: A, B, and M. The A and B ports correspond to the A and B ports on the CPU module, to which they are connected. The M (for Maintenance) port provides a third independent port for remote maintenance access to the active or standby Control Computer. *StarKeeper II* NMS typically does not use the A port of a Control Computer; it is left available for use by a local console. *StarKeeper II* NMS provides access to the B and M ports using the **console** command, and provides access to port B using a console connection and the pass-through command (see the **Issuing Network Commands** section of **Chapter 2**).

IMPORTANT:

There is a distinction between gaining access to a node through the **console** command and gaining access to a node through pass-through. The **console** command provides greater flexibility in the type of node commands that can be used at the expense of reduced functionality from *StarKeeper II* NMS.

The following list identifies the major differences between a console session and pass-through:

- A console session interaction is not logged; pass-through sessions are logged in \$CONSLOG.
- A console session prevents *StarKeeper II* NMS from collecting alarms from the connected node.

- A console session establishes exclusive access to the connected port, which means only one console session can exist on a communication port at a time. The **-k** option for the **console** command is used to terminate an existing console session so that a port can be accessed; be careful when using this option since it kills the outstanding console session.
- The **console** command can only be run as the user *cnmsadm*; pass-through can be run by any *StarKeeper II* NMS user.
- A console session is terminated by entering a **~**. (tilde dot).

When the **console** command is invoked, you have the option of selecting a port connection by using the **-p** option. This option takes a single argument, either **c** or **m**. The **c** indicates the B port is to be used, **m** indicates the M port is to be used.

The only way to gain direct access to the M port is through the **console** command. Pass-through is not supported for the M port due to the type and format of commands and messages associated with the M port. However, the M port can be used to provide access to the B port for use by pass-through. This is done by making the DKII-MAINT connection active (this is not the **console** command, this connection is made active by using the **cf** commands).

Messages from the **console** command can be viewed in the Event Log. Refer to **Chapter 7** for a discussion of the Event Log. If you lose a connection to the MRC you will receive a message stating: 10039 REPORT CNMSMSG monitor: Process <procname> for node <name> died due to loss of line.

To determine if the loss of line was the M port or the B port, enter the **connections** command and observe which connection is reported as *Disconn*. For a discussion of the **connections** command, refer to the **Connection Problems** section in **Chapter 7**.

Connection Classes and System Synchronization

Once you have configured your connections, administration becomes more routine. In order to keep your Core *StarKeeper II* NMS informed of changes in your network, various synchronization commands must be run at the appropriate times to update the *StarKeeper II* NMS database with accurate network information. These commands, **sk_sync**, **cfg_sync** and **conn_sync**, are discussed in detail in **Chapter 4**.

Administration Procedures for Host Connections

The following sections provide host connection procedures for console, performance and administration, and billing connections.

Console Connection Administration - Host Connection

At the console of each node from which you intend to establish a console connection, complete the following steps.

Procedure 3-3. Console Connection Administration - Host Connection

1. To create a unique node name, type **enter node/change node** at the prompt. Configure Port B as both a console and a printer. At the PORT B USED FOR prompt, enter **both**.
2. To create a console service address, type **enter group** and **enter address** at the console of each node in your network. Port B will be made part of a receiving group to receive calls. At the DIRECTION prompt, enter **receive**. At the GROUP prompt, enter the name of the group just created using the **enter group** command.
3. Be sure to record the service address on the worksheet provided in the *StarKeeper II NMS Planning Guide*.
4. Configure the node's TY module that connects to Port B via the D8AG cable. Configure the module as a console using the **enter ty/change ty** command. When the **enter ty** command prompts you for SERVICE TYPE, enter **console**. At the GROUP prompt, enter the group name just created using the **enter group** command.
5. Activate the TY port using the **restore ty** command.
6. The CPM-HS must now be configured using the **enter group** and **enter cpm** commands. To configure the CPM-HS, complete the steps in the following procedure.

Performance and Administration Connection Administration- Host Connection

For each performance and administration connection indicated on the worksheet provided in the *StarKeeper II NMS Planning Guide*, enter a service address on the corresponding network node (Procedure 3-4). These service addresses must belong to the group **?skimiep**. Once you have finished entering each service address, record the dial string for use when configuring System/Node connection in Chapter 4.

Procedure 3-4. Performance and Administration Connection Administration

1. You must enter two addresses: one for performance and one for administration.

At the CC0> prompt, type **enter address** and press .

2. The address should belong to the group ?skimiep.

If FRM-M2 performance measurements are to be collected from this node, an additional service address (belonging to the group ?nmsiep) must be entered (Procedure 3-5). This address must also be entered as the NM Server Dialstring on the Network Builder node form (refer to *Node Parameters* in Chapter 8 of the *StarKeeper II NMS Graphics System Guide*).

Procedure 3-5. Performance Connection Administration - FRM-M2 Measurement Collection

1. At the CC0> prompt, type **enter address** and press .

2. The address should belong to the group ?nmsiep.

Billing Connection Administration - Host Connection

At the console of each node from which you intend to collect billing data, create the service address *billing* by completing the steps in the following procedure.

Procedure 3-6. Billing Connection Administration - Host Connection

1. Enter the service address by typing **enter address** and pressing .
2. At the TYPE prompt, enter **mnemonic** and press .
3. Enter the mnemonic address as **billing** and press .
4. At the RESTORE NAME TO SERVICE? prompt enter **yes** and press .
5. Be sure to record the full dial string in the appropriate box on the worksheet.

Multiple Nodes Within the Same Exchange

If you have multiple nodes within the same area and exchange and want to collect billing data from more than one node, you must use the alias feature. Since the service address for collecting billing data is *billing*, the other names in the exchange must be unique. Use of the alias feature eliminates confusion when working with multiple nodes.

The other nodes within an exchange must know about the aliases. To accomplish this, use the **enter address** command on the node and follow the prompts. Figure 3-3 is an example of an exchange where the alias feature is necessary to make all the billing service addresses unique.

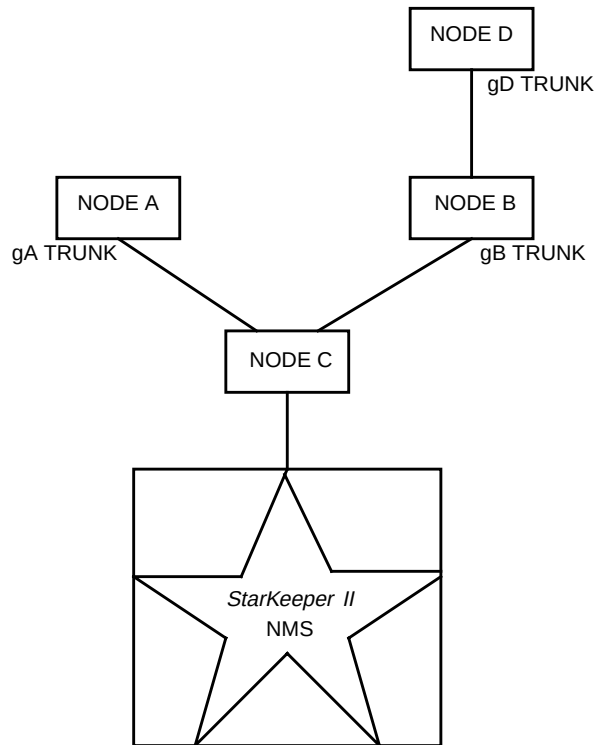


Figure 3-3. Example of an Alias Exchange

Procedure 3-7. Working with Multiple Nodes within the same Exchange

1. Assume that an exchange called "sloop" has four nodes named node A, node B, node C, and node D as shown in Figure 3-3. Also assume the following:
 - the host computer connects to node C
 - node A and node B each trunk to node C
 - node D trunks to node B
2. Next, let **gAtrunk** be the trunk group for the connection between node A and node C, and let **gBtrunk** be the trunk group between node B and node C. Finally, let **gDtrunk** be the trunk group between node B and node D.
3. Use the **enter address** command to establish the alias (**?lcl**) for node A.

4. Similarly, you must establish an alias for the "sloop" exchange at node B, node C, and node D. At this point each node has an alias, but for the alias feature to succeed, the other nodes in the exchange must know all the other aliases.
5. Next, use the **enter address** command with **al_nodeB** and **gBtrunk** to tell node C of the alias exchange for node B.
6. Next, use the **enter address** with **al_nodeD** and **gBtrunk** at node C to tell node C of the alias exchange for node D. The trunk group name is the first trunk on the path from node C to node D.
7. Next, use the **enter address** command with ADDRESS of **al_nodeD** and the GROUP of **gDtrunk** at node B.

The following rules sum up the alias feature:

- If you have *x* nodes in an exchange that will all be collecting billing data, then at the console of each *x* node, use the **enter address** command to establish a unique alias for the exchange.
- If the path from *StarKeeper II* NMS to node 1 uses node 2, then node 2 must have information about the alias for node 1. The **enter address** command must be entered at node 2 to inform node 2 about the alias for node 1. The trunk group used is the first trunk on the path from node 2 to node 1.

Refer to the node's reference documentation for more information.

Using the Sysadm Menu

The following sections discuss the system administrative tasks performed from the SYSADM Menu, which you access by entering **SKsh** at the SK : prompt and choosing SYSADM at the Main Menu. Refer to **Chapter 2** for a discussion of the menu hierarchy.

IMPORTANT:

To execute the **SKsh** command, set Environment variable rows to greater than or equal to 24, and the Columns to greater than or equal to 80. If "Columns" is set to a smaller size, the **SKsh** command will not execute, but instead will exit with an error message indicating the problem.

The Sysadm Menu is illustrated in Screen 3-1 and the choices are briefly described in Table 3-2.

StarKeeper (R) II Network Management System - Selection Menu			
Select	Description	Menu: Sysadm.	Level: 2
PORTMGMT	Port Management		
BILLMGMT	Bill Management		
ALRMMGMT	Alarm Management		
DBUTILS	Initialize or Regain space from Database and Tables		
PERFMGMT	Performance Measurements Management		
STARTSK	Startup StarKeeper II NMS		
SHUTSK	Shutdown StarKeeper II NMS		
SKIICONN	Modify StarKeeper II NMS connection parameters		
Enter a selection (or ?selection for help) and press RETURN			

Screen 3-1. Sysadm Menu

Table 3-2. Description and Reference for SYSADM Choices

Choice	Description	Reference
PORTMGMT	Specifies how the host computer tty ports are connected to the network.	-
BILLMGMT	Specifies the parameters needed for the billing period: the number of days billing records should remain in the database and cost factors for calls.	Billing Management in this chapter.
ALRMMGMT	Specifies how many days critical and major alarms are kept in the active alarm table before a cleanup deletes them.	Alarm Management in this chapter.
DBUTILS	Reinitializes an existing database and regains space from the database tables.	Database Maintenance in Chapter 7
PERFMGMT	Specifies the node measurements to be polled, facilitates node clock synchronization, and sets database retention time.	Performance Measurements Management in this chapter.
STARTSK	Starts the <i>StarKeeper</i> II NMS software.	Starting Up <i>StarKeeper</i> II NMS in this chapter.
SHUTSK	Shuts down the <i>StarKeeper</i> II NMS software (but leaves the Operating System running).	Shutting Down <i>StarKeeper</i> II NMS in this chapter.
SKIICONN	Specifies the connection parameters for <i>StarKeeper</i> II NMS to <i>StarKeeper</i> II NMS connections. A unique local machine ID, service address, and listener address is established for <i>StarKeeper</i> II NMS.	<i>StarKeeper</i> II to <i>StarKeeper</i> II Connections in this chapter.

Each SYSADM selection is explained in the sections that follow. The sections are presented in the same order as they appear on the Sysadm Menu, except STARTSK and SHUTSK are discussed first because these operations are performed as part of the other SYSADM procedures.

Starting Up *StarKeeper II* NMS (STARTSK)

You have to restart *StarKeeper II* NMS, after a shutdown, to restart the processes. Startup, after Shutdown, allows the *StarKeeper II* NMS software to recognize the new configuration. To start up (or restart) the *StarKeeper II* NMS processes, follow the steps of Procedure 3-8.

Procedure 3-8. How to Start (or Restart) *StarKeeper II* NMS

1. At the SK: prompt, enter **SKsh** to call the Main Menu.
2. From the Main Menu, choose SYSADM by entering **s**. You will enter the Sysadm Menu.
3. From the Sysadm Menu, choose STARTSK by entering **st**.

Even when *StarKeeper II* NMS is shut down, you can still access the menu system.

Shutting Down *StarKeeper II* NMS (SHUTSK)

There are times when *StarKeeper II* NMS has to be shut down (and then restarted). Some examples are when initializing the database, or when troubleshooting hardware or software. To shut down the *StarKeeper II* NMS processes follow the steps of Procedure 3-9.

Procedure 3-9. How to Shut Down *StarKeeper II* NMS

1. At the SK: prompt, enter **SKsh** to call the Main Menu.
2. From the Main Menu, choose SYSADM by entering **s**. You will enter the Sysadm Menu.
3. From the Sysadm Menu, choose SHUTSK by entering **sh**.

StarKeeper II NMS can be brought down alone or with the operating system (OS). *Always shut down the StarKeeper II NMS before shutting down the OS.* Wait at least 70 seconds between a shutdown and a startup; complete this procedure, wait 70 seconds, and then complete Procedure 3-8.

Billing Management (BILLMGMT)

Billing Management is the process of setting billing data retention parameters and billing charge factors to users of the network. Data collected from billing records can be used as a network management aid, even if charges are not applicable.

You can view the current billing parameters by entering ***billing -v*** at the SK: prompt. The screen below shows a sample presentation. *Message Units* is a generic term for *packets* or *segments*.

```
--Billing Control File Parameters--
SWITCHED DATA RETENTION PERIOD:  3 days
PERIODIC DATA RETENTION PERIOD:  4 days
DURATION CHARGE PER HOUR:         $4.50
CHARGE PER MESSAGE UNIT:          0.0025 cents
```

Screen 3-2. Sample Billing Control File Parameters

⇒ NOTE:

All monetary amounts shown in this guide are only for illustration purposes. They are not, in any way, meant to be representative charges.

Procedure 3-10. How to Use the Billing Management Utility

1. To access the Billing Management utility, enter ***SKsh*** at the SK: prompt, choose SYSADM at the Main Menu, and then choose BILLMGMT from the Sysadm Menu (Screen 3-1). Or, you can enter ***billing*** at the SK: prompt and skip to Step 5.
2. You are prompted for the pathname of the SK base directory. Enter the default.
3. You are prompted for the *StarKeeper* II NMS release number. Enter the release of your *StarKeeper* II NMS software by choosing the default.
4. The following appears on the screen:

Enter the following billing parameter
If a default appears in the question, type <RETURN> for the default

5. You are prompted, line by line, to specify the billing parameters. The prompting is reproduced in the following screen and each prompt is discussed after the screen presentation.

```
BILLING DATA (SWITCHED CALLS) RETENTION PERIOD [no of days: +(3)]:
BILLING DATA (PERIODIC) RETENTION PERIOD [no of days: +(4)]:
DURATION CHARGE PER HOUR [dd.cc : +(3.25)]:
CHARGE (CENTS) PER MESSAGE UNIT [c.xxxx : +(3.0250)]:
```

BILLING DATA (SWITCHED CALLS) RETENTION PERIOD

Specify how many days the billing data for switched calls is to remain in the database. The default value, as supplied with an initial installation, is 3 days.

BILLING DATA (PERIODIC) RETENTION PERIOD

Specify how many days the billing data for direct calls is to remain in the database. Default value, as supplied with an initial installation, is 4 days.

DURATION CHARGE PER HOUR

Specify the charge per hour for a network connection in a dollar and cents format. For example, 3.25 is a \$3.25 charge per hour for a network connection. (See note below.)

CHARGE (CENTS) PER MESSAGE UNIT

Specify the charge per message unit in a cents and fraction of cents format. For example, 3.025 is a 3.025 cents charge per message unit.

⇒ NOTE:

There are no set monetary default values (the default at initial installation is \$0.00). The default values that you will see are those values from the last change. Therefore, if you change the monetary amount, that new charge becomes the default value. An example is shown in the previous screen.

Message Units is a generic term for *packets* or *segments*.

6. When you make your last entry, the newly specified billing data takes effect and you are returned to the Sysadm Menu. If there are monetary values specified for both the "duration charge" and "cents per message unit," they will both be applied.

Alarm Management (ALRMMGMT)

Alarm Management is the process of specifying how many days critical and major alarms are to be kept in the active alarm database before they are deleted.

⇒ NOTE:

All informational alarms are cleared as they are received. Minor and informational alarms are deleted from the database daily during nightly cleanup. Critical and major alarms are retained for a specified number of days before being deleted, as set by the Alarm Management function (Procedure 3-11).

Procedure 3-11. How to Use the Alarm Management Utility

1. To access the Alarm Management utility, enter **SKsh** at the SK: prompt, choose SYSADM at the Main Menu, and then choose ALRMMGMT from the Sysadm Menu (Screen 3-1).
2. You are prompted for the pathname of the SK base directory. Choose the default.
3. You are prompted for the *StarKeeper* II NMS release number. Enter the release of your *StarKeeper* II NMS software by choosing the default.
4. You are prompted for the active alarm retention period (in days).

The prompting is reproduced in the following screen, and described after the screen.

ACTIVE ALARM RETENTION PERIOD [no. of days: + (1)]:

ACTIVE ALARM RETENTION PERIOD

Specify how many days critical and major alarms are to be kept in the active alarm database. The default is one day. Specifying **-1** (minus one) means the alarms will *not* be cleared during alarm cleanup. Specifying **0** means all alarms received before nightly cleanup on the day it occurs, will be deleted. Link Down alarms (message ID's beginning with "LD_") are retained until the condition is cleared, regardless of the retention period you choose.

5. When you make your last entry, the newly specified alarm retention period takes effect and you are returned to the Sysadm Menu.

Database Utilities (DBUTILS)

The Level 2 Sysadm Menu gives you access (the DBUTILS choice) to database utilities that assist in tasks done during installation and maintenance of StarKeeper II NMS. These tasks are to initialize the database and to recover disk space. The utilities are selected from the Level 3 DBUTILS Menu. You can also reinitialize the database as described in **Appendix G**. Instructions on regaining space in database tables are also given in **Chapter 7**.

Since changes to a database must be made while *StarKeeper* II NMS is shut down, and they do not take effect until *StarKeeper* II NMS is restarted, the DBUTILS Menu also has selections for shutting down and restarting *StarKeeper* II NMS.

Performance Measurements Management (PERFMGMT)



NOTE:

 **z** will exit the performance measurements application.

Performance Measurements Management has three objectives: to specify the measurements to be generated at the node, to turn on/off the automatic synchronization of clocks, and to specify retention periods for the performance measurements database. Measurements generated at the node are polled by *StarKeeper* II NMS. By default, all measurements are off. If you want to poll measurements, you must use MEASMGMT to schedule them. Follow the Steps in Procedure 3-12 for Performance Measurements Management.

Procedure 3-12. How to Use the Performance Measurements Management Utility

⇒ NOTE:

To access the Performance Measurements Management utility, enter **SKsh** at the SK: prompt, choose SYSADM at the Main Menu, and then select PERFMGMT from the Sysadm Menu (Screen 3-1).

1. You are presented with a Level 3 submenu (see Screen 3-3).

StarKeeper (R) II Network Management System - Selection Menu

Select	Description	Menu: Sysadm.	Level: 3
CLKMGMT	Synchronize node clocks		
MEASMGMT	Specify node measurements to poll		
RETNMGMT	Specify the performance reports retention date		

Enter a selection (or ?selection for help) and press RETURN

Screen 3-3. Perf Menu

2. Select CLKMGMT if you want to turn on/off the node clock synchronization. CLKMGMT displays (and can change) who is controlling the node clocks. For earlier node releases, the clocks can be controlled by *StarKeeper II* NMS or locally by each node. The default is *StarKeeper II* NMS. For BNS-2000 (R2.0 and later) and *Datakit II* VCS (R4.0 and later), *StarKeeper II* NMS controls clock management.

⇒ NOTE:

If *StarKeeper II* NMS is monitoring the performance connection to the nodes, it will reset the time on the nodes to the correct value if the time drifts by more than 5 minutes.

The system displays a message telling you if the NMS is currently controlling the node clocks, and asks if you want to change it.

3. Choose **y** or **n** accordingly. You are returned to the Perf Menu (Screen 3-3).
4. Select MEASMGMT if you want to change or verify the current node measurements. This option brings up a ring menu as shown in Screen 3-4. (See **Chapter 2** for a full discussion.) Observe the help messages on the top and bottom lines of the forms as you search for records and verify data; the help messages will assist you each step of the way. Help is also available at the menu level by pressing **h** or at any level by pressing Ctrl **o**.

DEFINE PERFORMANCE MEASUREMENTS: Change Verify Help

**one-line help message appears here **

Screen 3-4. Define Performance Measurements Ring Menu

⇒ NOTE:

Not all module types are valid for all releases. If you enable performance collection for a module that is not supported by the node you are configuring, you will not receive an error, but no measurements will be collected for that module for that node.

The ring menu sits on top of a performance measurement record screen (see the following screen).

Node address	Measurement connection		
ai	frm	samm1	x25
bisync	frm-m2	sd1c8	x25.p
concentrator	gar	shelf M1	x75
Connection	lpm	trunk	
cpmm1	node bp detail	tsm8	
dkap	sam	tsmt1	

Screen 3-5. Performance Measurement Record

5. To verify the current performance node measurements, choose press **Ctrl**. The message on the bottom of the screen prompts you to input search criteria to identify the records to be verified (the node address for performance measurements). Complete Step a or b.
 - a. Enter the address of the node that you want to verify for performance measurements and press **Ctrl g**.
 - b. To call all records for verification, press **Ctrl g** without specifying any search criteria.
6. The process retrieves all records that correspond to the search criteria and displays the performance measurements form for the first record.
7. At the top of the form will be the Verify Ring Menu (Screen 3-6).

VERIFY: Next Previous Jump First Last Help

Screen 3-6. The Verify Ring Menu

8. Choose the record you want to verify, as explained below:
 - **Next** ...if you want to call the next record to the screen.
 - **Previous** ...if you want to return to the previously-displayed record.
 - **Jump** ...if you want to go directly to a numbered record.
 - **First** ...if you want to return to the first record.
 - **Last** ...if you want to call the last record to the screen.
 - **Help** ...if you want screen help on the application or the use of special keys.

9. The retrieved records display whether the performance measurements are generated on the node (**Y** or **N**) for the selected measurement. This is illustrated in the following example.

Node address		sknodea					
Measurement	connection	inactive					
ai	Y	frm	Y	samml	Y	x25	Y
bisync	Y	frm-m2	Y	sd1c8	Y	x25p	Y
concentrator	Y	gar	Y	shelf M1	Y	x75	Y
Connection	Y	lpm	Y	trunk	Y		
cpmm1	Y	node by detail	Y	tsm8	Y		
dkap	N	sam	Y	tsmt1	Y		

Records 6 of 9

10. When you finish verifying the node measurements, press to return to the Define Performance Measurements Ring Menu. There you can choose to Change node measurements or exit to the Perf Menu (Screen 3-3) by pressing .
11. To Change the node performance measurements, choose **Change**. The program prompts you to input the node address for the performance measurements you want to change. Enter the node address and press **g** to initiate the search for the selected record. To call all records, just press **g** without specifying anything.
12. The process retrieves all records that correspond to the search criteria and displays the performance measurements form for the first record.
13. The Change Ring Menu will appear at the top of the form (Screen 3-7).

CHANGE: Change_this_record Next Previous Jump First Last Help

Screen 3-7. The Change Ring Menu

14. Call the record you want to change to the screen (as described in Step 9); then select **Change_this_record**.
15. Press to skip from field to field until you get to the field you want to change. For node measurements you do not want to generate, change the **Y** to **N**. For measurements you do want to generate, change the **N** to **Y**.

⇒ NOTE:

The default (as installed) selection is **N**. It is inefficient to poll (polling is done every hour) for measurements that do not apply to the node. This selection is used to change that condition. Only specify those entities that you want to poll.

16. Activate the changes by pressing **g**.

17. When the change is entered into the database, you are returned to the Change Ring Menu. There you can choose to change the performance measurements for another node or press to begin the exit out of the menu system.
18. Select RETNMGMT if you want to modify the performance retention parameters. This interface simply prompts you for the length of time you wish to retain the data, the ranges of 1-7 days for daily tables (initial default = 2), 1-3 weeks for weekly tables (initial default = 3), and 1-3 months for monthly tables (initial default = 3). If you change any of the default values, the value you change it to becomes the new default value.

StarKeeper II NMS to StarKeeper II NMS Connections (SKIICONN)

Each *StarKeeper II* NMS Core and Graphics System must be assigned a unique machine ID and must have knowledge of its local service address, such as *west/garden/star1*, and knowledge of the listener address. These parameters are initially administered during installation, but can be changed through SKIICONN.

The procedure to change the current machine ID is accomplished with the SKIICONN selection of the Sysadm Menu (Screen 3-1). Once set, this information usually does not change; however, if you do want to change any of these parameters, complete the instructions in the following procedure. The machine ID must be an integer between 1 and 100, inclusive, and must be unique among other *StarKeeper II* NMS machines within the *StarKeeper II* NMS network. The assignment of the local machine ID must be made with consideration of the machine IDs that are assigned to the other *StarKeeper II* NMS machines that comprise the network. This parameter may be changed only when *StarKeeper II* NMS is not running, or by running the installation procedures again.

The listener address is the address that the listener process on the local machine responds to when a remote *StarKeeper II* NMS attempts to establish a connection to the local machine. The listener address must be fully qualified (that is, the complete mnemonic address) and entered as a service address in the node that provides network connectivity for the local machine. A listener address can contain up to four levels, with each level containing up to eight characters or digits. By convention, the lowest level of the listener address is the uname of the local machine in all capital letters. You must have root permissions to modify the listener address.

Procedure 3-13. Administering the Machine ID and Server/Listener Address

1. Log in as **cnmsadm** and press .
2. Enter **SKsh** from the *StarKeeper II* NMS prompt and press to bring up the *StarKeeper II* NMS Main Menu.
3. Enter **s** and press to choose SYSADM from the Main Menu. You are now in the Sysadm Menu.
4. From the Sysadm Menu, enter **sh** and press to choose SHUTSK.
5. When *StarKeeper II* NMS has been brought down, press to return to the Sysadm menu.
6. Choose SKIICONN from the Sysadm Menu. The following screen appears.

```
StarKeeper(R) II NMS Connections -- Main Menu
1) Display connection parameters for <machine name>
2) Modify machine ID
3) Modify service address
4) Modify listener address
5) Help
6) Exit
Please enter selection [ 1-6 +(1) ]:
```

7. Enter **2** to modify the machine ID. It is important that this ID be unique with respect to all *StarKeeper II* NMS machines in your network. The machine ID should be recorded on the worksheet provided with the *StarKeeper II NMS Planning Guide*. The following screen appears.

```
Please enter new machine ID for <machine name>, which must be unique
with respect to all the machines in your StarKeeper II NMS network
(or enter 'return' for main menu):
```

8. Enter the machine ID and press .
9. Enter **3** and press to modify the service address. The following screen appears.

```
Please enter new service address, which must be fully qualified and unique
with respect to all the machines in your StarKeeper II NMS network
(or enter 'return' for main menu):
```

10. Enter the service address and press . The address should also be recorded on the worksheet provided with the *StarKeeper II NMS Planning Guide*.

11. Enter **4** and press to modify the listener address. The following screen appears.

You must be root to modify the listener address.
Please enter root password.
Password:

12. Enter the root password and press The following screen appears.

Please enter new listener address for <machine name>, which must be fully qualified and unique with respect to all the machines in your StarKeeper II NMS network.

By convention, the lowest level of a listener address is the local machine's uname in all capital letters <MACHINE NAME>.

Enter new listener address, or '+' for default of <service address> or enter `return' for main menu:

13. Enter the listener address and press .
14. You can check the values you entered by entering **1** at the *StarKeeper®* II NMS Connections Main Menu.
15. If everything is correct, enter **6** to exit from the *StarKeeper®* II NMS Connections Main Menu.
16. From the Sysadm Menu, choose STARTSK by entering **s** and pressing .

StarKeeper II NMS will be started shortly.

Node Software Management

Node software management is a new approach to performing node software upgrades. With this approach, the Network Administrator is not required to be physically present at the node site when upgrading node software. A node software download and upgrade can be performed through the network at a centralized site on a *StarKeeper II* NMS.

The Node Software Download and Upgrade feature supports the downloading of node release software or patches for controller or module software. The downloaded software is a file system or "image" to upgrade a node. In most cases the node "image" and "patches" are handled as one and are collectively referred to as the **node software**. When it is necessary to distinguish between the two, the former will be termed the **node release** and the latter referred to as the **patch**.

The Node Software Download and Upgrade feature in *Datakit II* VCS Release 5.0 (or later) and BNS-2000 Release 3.0 (or later) supports the following:

- Loading node software to a *StarKeeper II* NMS host
- Downloading node software to a node
- Activating the new node software
- Performing a database upgrade on the current node configuration data, if necessary

You will have the choice to use existing node software upgrade procedures provided in the related node user documentation (executed locally on the node console) or to use the Node Software Download and Upgrade feature available through *StarKeeper II* NMS.

A user interface is provided by *StarKeeper II* NMS to handle the loading and downloading of node software and the related functions such as status and reports. This user interface is available through **SKsh**. Other processes, such as activating the new node software and upgrading the node configuration database require human intervention and have to be carried out either on the node console or through the **console** command provided by *StarKeeper II* NMS.

Prerequisites

- You must have a 1GB file system dedicated to the node software download and upgrade feature. This will minimize the disk usage impact on existing *StarKeeper II* NMS operations.
- The *StarKeeper II* NMS installation process will automatically create a user login **ndswadm** for the Node Software Download and Upgrade feature. During installation, you will be prompted to enter a password for this login.
- You are required to login as **ndswadm** in order to use certain Node Software Management commands. If you are not logged in as **ndswadm** the process will prompt you for the **ndswadm** password.
- When creating the **ndswadm** login, the *StarKeeper II* NMS installation process also creates an environmental variable called `$SWDL_BASE` in the *.profile* of **ndswadm**. `$SWDL_BASE` is the base directory for all software download activities. By default, `$SWDL_BASE` is created to point to `/swdl`, which is the recommended mount point for the 1GB file system dedicated to the Node Software Download and Upgrade feature. Refer to **Appendix B** for details on creating a file system.
- By default, the tape device name on the *StarKeeper II* NMS machine is `/dev/rmt/0m`. If you use a tape drive that is configured with a different device name, an environmental variable `$TAPE_DEVICE` should be set up and exported (in the *.profile* of **ndswadm**) before using the Node Software Download and Upgrade feature.
- Before using the Node Software Download feature, a local service address must be configured and assigned to the group **?nmsiep** on the node receiving the download. This dialstring should be in service and reachable from the node where the *StarKeeper II* NMS host is connected. The multi-level addressing scheme is a node standard, with which network users should be familiar. If you consider this addressing scheme cumbersome or cannot clearly identify the node receiving the download, an alternative is to use the "speedcall" feature available on the node. For example, instead of using `usa/nj/oak/oakiep` to address the nmsiep endpoint on the node *oak* you can administer a speedcall *oakiep* on the node where *StarKeeper II* NMS is connected.

Summary of Node Software Management Commands

The Node Software Management commands are only accessible using the SKsh menu system. To access these commands, enter **SKsh** at the SK: prompt, and choose NDSWMGMT at the Main Menu. The following screen is a reproduction of the NDSWMGMT Menu.

StarKeeper (R) II Network Management System - Selection Menu			
Select	Description	Menu: Ndswwgmt	Level: 2
LOAD	Load node software to this host		
DOWNLOAD	Download node software to a node		
VALIDATE	Validate downloaded node release		
STATUS	Display download status and records		
REPORT	Report available node software and disk space usage on this host		
SCHEDULE	Schedule node software downloads		

Enter a selection (or ?selection for help) and press RETURN

Screen 3-8. SKsh NDSWMGMT Menu

The NDSWMGMT options are described in the following paragraphs.

Loading Node Software to the *StarKeeper II* NMS Host

Loading node software to the *StarKeeper II* NMS host refers to the process that creates a copy of node software on the *StarKeeper II* NMS host so that the software can be downloaded to nodes in the network.

Node software is distributed on a DDS tape that is readable by *StarKeeper II* NMS. The DDS tape is made with a directory structure that identifies the node software to be distributed so that you do not need to know where on the *StarKeeper II* NMS host the node software should be stored.

Procedure 3-14. Loading the Node Software

1. At the SK: prompt enter **SKsh**, choose NDSWGMT at the Main Menu and then choose LOAD from the NDSWGMT Menu.

If the process determines that there is not enough file space on the file system where the node software is to be stored (that is, less than 60MB), the following message is displayed:

**WARNING! Available disk space is running low: <actual free space> KB.
Please clean up <\$SWDL_BASE>.**

Disk usage by node software loaded on the StarKeeper II NMS host will not grow beyond 1GB. This process will not load any node software if the disk usage of \$SWDL_BASE or its mounted filesystem (as reported by the **bdf** command) is greater than 999950 KB. When this occurs, the following is displayed and the process exits.

**LOAD TERMINATED! Disk usage has exceeded 999950 KB.
Cannot proceed with the LOAD process.
Please clean up <\$SWDL_BASE> to recover free disk space before
proceeding with LOAD.**

When the process is ready to load the node software, the following message is displayed:

**Please ensure the correct tape is inserted in the DDS tape drive.
When the tape drive is ready, press RETURN to start or 'q' to quit:**

2. Press . If the tape is not inserted or the tape drive is not ready, the following message is displayed:

**<tape device name>: cannot open
Failure in reading tape.
Please ensure the correct tape is inserted in the DDS tape drive.
When the tape drive is ready, press RETURN to start or 'q' to quit:**

3. When ready, press and the loading will begin. This will take a few minutes to complete.

When loading is complete, a list of the node software loaded is displayed on the screen. A record is stored in the log file in the following format:

```
Thu Jan 1 16:00:39 EDT 1998: LOAD node software from <source> to <target>
started.
<node software file name(s)>
<no. of blocks>
Thu Jan 1 16:01:29 EDT 1998: LOAD node software completed.
```

In the screen above, **source** is `$TAPE_DEVICE` and **target** is `$SWDL_BASE`.

4. Press to return to the NDSWMGMT menu.
5. If desired, proceed to **Downloading Node Software to a Node**.

Downloading Node Software to a Node

Downloading node software to a node refers to the process that delivers a copy of node software that has been loaded to a *StarKeeper* II NMS host to a node in the network. The download is handled on a per-node basis and can be run as a background process. You can also schedule downloads to occur at a later time (see the **Scheduling Node Software Download** section). If the download fails because the node is busy or out of service, the process will retry two more times. The first retry will take place one minute after the initial failure, and the second retry will be two minutes after the first retry.

After a node release is downloaded to a node, the node release must be validated before it is used to boot up the node. The release must be validated to ensure data was not corrupted during the file transfer. This validation must be done as a separate step under the NDSWMGMT menu.

Procedure 3-15. Downloading the Node Software

1. At the SK: prompt enter **SKsh**, choose NDSWMGMT at the Main Menu and then choose DOWNLOAD from the NDSWMGMT Menu.
You will be prompted for an *nmsiep* dialstring, as described in the prerequisites section.
2. Enter the *nmsiep* dialstring for the desired node.
3. If a problem arises during dialstring validation an error message is displayed. Contact your System Administrator if you cannot rectify the error situation, and provide any error codes included in the message.

If the *nmsiep* dialstring validation is successful, the following is displayed:

Retrieving node information ...
The node is running <node type> Release <rel number>, Build <bld number>
Please enter the file name or directory name to be downloaded:

4. Enter the file or directory name.

The file/directory name can be found from the tape label or from instructions that come with the tape. It is in the form of r.x.x.xx or p.x.x.yy. It can also be identified by selecting "NDSWMGMT - REPORT" through **SKsh**.

If the file name entered is in the form of r.x.x.xx, where x ranges from 0-9, the node software to be downloaded is an image of a node release. For example, r.5.1.34 represents an image of release 5.1, build 34.

If the file name or directory name entered is in the form of p.x.x.yy, the software to be downloaded is considered to be a patch for controller or module software. The x.x represents the release number of the patch and yy represents the patch ID. For example, p.5.1.frm4 represents a patch to release 5.1, whose patch ID is frm4.

After a valid file/directory name is accepted, the prompting sequence for download is complete. The following message is displayed:

Download is being processed in the background.
Select "NDSWMGMT - STATUS" through **SKsh** to check the status.
Press **RETURN** to return to the *Ndswmgmt* menu:

5. Depending on the load on the network and the size of the release, a download may take anywhere from 30 to 60 minutes to complete. You can monitor the status using the STATUS option on the NDSWMGMT Menu. See the **Displaying Download Status and Records** section.
6. After a software release has been downloaded, begin the validation process by choosing VALIDATE from the NDSWMGMT Menu.

⇒ NOTE:

You will not be permitted to activate the downloaded software until after it has been validated. Patch downloads do **NOT** need to be validated.

7. You are prompted for an *nmsiep* dialstring. Enter the dialstring for the desired node.

The following is displayed:

```
Retrieving the most recent download record for this address ...
<time>: Download <node type> Release <rel number>, Build <bld number>
to <dialstring>

Retrieving downloaded node software information ...
The downloaded node release is <node type> Release <rel number>, Build
<bld number>

Is this the node release you want to validate [(y)es, (n)o: (+y)]:
```

8. Check the information displayed and respond with **y** or **n** as appropriate.

If you respond with a **y**, the validation begins and the following is displayed:

```
Validating the downloaded node release, please do not interrupt.
Starting time: 10:30
This may take up to 5 minutes, please wait ...
```

If the validation is successful, the following is displayed:

```
<node type> release <rel number>, build <bld number> download to
<dialstring> has been validated.
You can proceed to install the node release.
Press RETURN to return to the NDSWMGMT menu:
```

If the validation failed, the following is displayed:

```
<node type> release <rel number>, build <bld number> download to
<dialstring> failed the validation.
Please restart the download process.
Press RETURN to return to the NDSWMGMT menu:
```

In both cases, the first two lines of the message will also be logged into the log file, with a timestamp added to the beginning to make a 3-line entry as a record for this validation.

9. Press to return to the NDSWMGMT Menu.
10. Activate the new node software. See the **Activating New Node Software** section.

Scheduling Node Software Downloads

As an alternate to executing a download immediately, you can schedule a Node Software Download to start at a time that is more convenient or results in less impact on *StarKeeper* II NMS and node operations.

The following procedure details the steps for doing a Node Software Download.

Procedure 3-16. Scheduling a Download

1. At the SK: prompt enter **SKsh**, choose NDSWGMT at the Main Menu and then choose SCHEDULE from the NDSWGMT Menu.

The following Schedule Menu is displayed:

SCHEDULE MENU

1. Schedule node software downloads
2. Report scheduled downloads
3. Change scheduled downloads
4. Delete scheduled downloads q. Quit this menu

Please enter your selection:

2. Choose 1 from the Schedule Menu.

You will then be prompted for the same information required for an immediate download.

3. Enter a valid *nmsiep* address and the file or directory name to be downloaded, which was described in Procedure 3-15, Steps 2 through 4.

You are prompted for the download start time:

Current system time is: Thu Jan 1 13:19 EDT 1998 [01/01, 13:19] Please enter the date and time the download should start [MM/DD, HH:MM]:

4. Enter download start time.

The date and time the download should start is in the form of month[1-12]/day[1-31], hour[0-23]:minute[0-59].

**NOTE:**

SCHEDULE does not require a year to be entered as part of a schedule. If the date and time entered is later than the current system date and time, the schedule will be the date and time of the current year. If the month entered is the current system month, and the day or time entered is before the current system day or time, the user will be warned that this schedule is for the next year. For example, on January 1, 1998 at 7:30 a.m. the user schedules a download for 01/02, 03:00, this download will take place at 3 a.m., January 2, 1998; if the schedule is 01/03, 03:00, the download will not take place until 3 a.m., January 3, 1998. If the schedule is 01/04, 02:00, you will be prompted to confirm the 2 a.m., January 4, 1998 schedule or re-enter the date and time.

Once the schedule is validated, the following message is displayed:

```
Download scheduled.
Do you want to schedule another download [(y)es, (n)o: (+y)]?
```

5. Responding with **y** will return you to Step 3 of this procedure; responding with **n** will result in the display of the download schedule:

The new schedule in effect:

```
1. Thu Jan 2 09:02:00 1998 Download /usr2/swdl/DK/r5.1/p.5.1.2 to oakiep
2. Thu Jan 2 09:02:01 1998 Download Datakit II VCS Release 5.1, Build 27 to oreoiep
```

Press **RETURN** to return to the **SCHEDULE MENU**:

Depending on the load on your network and the size of the release, a scheduled download may take anywhere from 30 to about 60 minutes to complete.

6. You can determine if the download is complete by using the **STATUS** option of the **NDSWMGMT** Menu. See the **Displaying Download Status and Records** section.
7. After a scheduled download of a software release is complete, begin the validation process by choosing **VALIDATE** from the **NDSWMGMT** Menu.

**NOTE:**

You will not be permitted to activate the downloaded software until after it has been validated. Patch downloads do **NOT** need to be validated.

8. You will be prompted for an **nmsiep** dialstring. Enter the dialstring for the desired node.

The following is displayed:

```
Retrieving the most recent download record for this address ...
<time>: Download <node type> Release <rel number>, Build <bld number> to
<dialstring>

Retrieving downloaded node software information ...
The downloaded node release is <node type> Release <rel number>, Build <bld
number>

Is this the node release you want to validate [(y)es, (n)o: (+y)]:
```

9. Check the information displayed and respond with **y** or **n** as appropriate.

If you respond with a **y**, the validation begins and the following is displayed:

```
Validating the downloaded node release, please do not interrupt.
Starting time: 10:30
This may take up to 5 minutes, please wait ...
```

If the validation is successful, the following is displayed:

```
<node type> release <rel number>, build <bld number> download to
<dialstring> has been validated.
You can proceed to install the node release.
Press RETURN to return to the NDSWMGMT menu:
```

If the validation fails, the following is displayed:

```
<node type> release <rel number>, build <bld number> download to
<dialstring> failed the validation.
Please restart the download process.
Press RETURN to return to the NDSWMGMT menu:
```

In both cases, the first two lines of the message will also be logged into the log file, with a timestamp added to the beginning to make a 3-line entry as a record for this validation.

10. Press to return to the NDSWMGMT Menu.
11. Activate the new node software. See the **Activating New Node Software** section.

Changing Scheduled Downloads

The only changes to a scheduled download that are supported are to the date and time of the download. If you wish to change the download itself (for example, new dialstring, source, destination, and so forth) a new download should be scheduled. Delete the old one and schedule a new one.

Procedure 3-17. Changing a Scheduled Download

1. At the SK: prompt enter **SKsh**, choose NDSWGMT at the Main Menu and then choose SCHEDULE from the NDSWGMT Menu.
2. Choose **3** from the Schedule Menu.

A list of scheduled downloads is displayed:

```
1. Thu Jan 1 00:02:00 1998 Download /usr2/swdl/DK/r5.1/p.5.1.2 to oakiep
2. Thu Jan 1 02:02:01 1998 Download Datakit II VCS Release 5.1, Build 27 to
   oreoiep
```

Please select the schedule you want to change [1-2, (q)uit]:

3. Enter the number of the desired schedule.

The date and time of the download is displayed and you are prompted for a new date and time.

```
Current system time is: Thu Jan 1 15:36 EDT 1996 [ 01/01, 15:36 ]
Please enter the date and time the download should start [ MM/DD, HH:MM ]:
```

4. Enter the new date and time.

The complete new schedule is displayed:

```
The new schedule in effect:
```

```
< new schedule>
```

```
Please select the schedule you want to change [<range>, (q)uit]:
```

5. Select another item from the list or enter **q** to quit.

Deleting Scheduled Downloads

The following procedure details the steps for deleting a scheduled download.

Procedure 3-18. Deleting a Scheduled Download

1. At the SK: prompt enter **SKsh**, choose NDSWGMGMT at the Main Menu and then choose SCHEDULE from the NDSWGMGMT Menu.
2. Choose 4 from the Schedule Menu.

A list of scheduled downloads is displayed:

```
1. Thu Jan 1 00:02:00 1998 Download /usr2/swdl/DK/r5.1/p.5.1.2 to oakiep
2. Thu Jan 1 02:02:01 1998 Download Datakit II VCS Release 5.1, Build 27 to
   oreoiep
```

```
Please select the schedule you want to delete [1-2, (a)ll, (q)uit]:
```

3. Enter the number of the desired schedule.

Either a message indicating that all scheduled downloads were deleted is displayed, or a complete new schedule is displayed:

```
The new schedule in effect:
```

```
< new schedule>
```

```
Please select the schedule you want to delete [<range>, (q)uit]:
```

Scheduled Download Reports

The following procedure details the steps for obtaining a scheduled download report.

Procedure 3-19. Obtaining a Scheduled Download Report

1. At the SK: prompt enter **SKsh**, choose NDSWGMGMT at the Main Menu and then choose SCHEDULE from the NDSWGMGMT Menu.
2. Choose **2** from the Schedule Menu.

A report of scheduled downloads is displayed:

Scheduled Download Report:

```
1. Thu Jan 1 09:02:00 1998 Download /usr2/swdl/DK/r5.1/p.5.1.2 to oakiep
2. Thu Jan 1 09:02:01 1998 Download Datakit II VCS Release 5.1, Build 27 to
   oreoiep
3. Fri Jan 2 09:00:00 1998 /usr/spool/cron/atjobs/776091600.a
   (may not be download related)
```

Press RETURN to return to the SCHEDULE MENU:



NOTE:

Line 3 of the report shows a scheduled task that may not be node software download related. This entry is possible if the user has scheduled some other task through a different schedule user interface. To check if this is a valid scheduled task, you need to examine the contents of the file listed. The file should be a script file that is to be executed at the time displayed. If this is indeed a valid scheduled task and not related to the node software download, no further actions are needed. If it is a scheduled node software download, then the download schedule may have been corrupted, which makes it unrecognizable to the process that reports scheduled downloads. If this happens, it is recommended to delete this schedule by deleting and rescheduling the download.

Activating New Node Software

Once the software download for a release has been done, it must be activated. Activating a new release is done by connecting to the node and executing a series of steps. Refer to the node documentation for details on activating your node software.

In order to upgrade to the new release software, you have to connect to the controller console. There is a command called **console** which is run on the *StarKeeper II* NMS host and connects to the B port of the controller. Additionally, the **console** command can be used to connect to the M port of the controller if it has MRC. It is necessary to connect to the MRC if you have dual controllers because automatic recovery must be disabled during the upgrade process.

Activating the new node software refers to the process that brings the newly downloaded node software into service. Depending on the nature of the node software downloaded, the process differs.

If the downloaded node software is a patch that may include one or more files, the process involves moving the downloaded files to the appropriate working directory, and, depending on the nature of the files, there may be a need to disrupt services of a module (for example, FRM), to reboot the node (for example, a call process or other special processes), or to simply overwrite an existing file (for example, OA&M and other on-demand processes.) Instructions specific to each patch download and upgrade will be provided with the software distribution media.

If the downloaded node software is a node release, the process involves a node reboot to bring up the new release. The command **install release** is provided by the node to perform this process. If it is necessary, a node configuration database upgrade, will be performed by the user. After the node configuration database is upgraded successfully, another node reboot is necessary to bring up the node with the new release, along with the upgraded node configuration database. The two reboots can be performed by using the **console** command to the node's port B from *StarKeeper II* NMS. When the node is rebooted on the new release, all the module software that has changed will be downloaded to each module that is in service. This will temporarily take down all existing calls.

After the node is rebooted successfully, you can continue with **install registration** and other administrative procedures to bring the node to the fully functional mode. After the reboot these steps can also be performed on the node console or through *StarKeeper II* NMS's **console** command to the node's port B.

Displaying Download Status and Records

The **STATUS** item on the NDSWMGMT Menu is used to report the status of in-progress downloads. The report will first summarize the number of in-progress downloads. Following the summary are entries, separated by a line of "====", of in-progress downloads. Each entry contains at least two lines. The first line reports the timestamp when the download started. The second line contains a brief description of the download that includes the source directory name or release identification, and the dialstring of the node's nmsiep endpoint. If a download fails at the first or the second attempt, the status information will contain, in addition to the two lines described above, the time the failure took place, the error message generated by **push**, and the error code.

Additionally, after the status is displayed, you will be presented with the opportunity to see all the records in the log file. A successful download record contains at least four lines of information. The first two lines are the same as the status report described earlier. The third line is the actual download command which is enclosed in parenthesis and is provided mainly for troubleshooting purposes. The fourth line is the timestamp when the download completed. For an unsuccessful download, the record contains at least six lines of information that differs from the successful one from the fourth line down. If the **push** command fails with its own error message, it will be included in the fourth line. The fifth line is the timestamp when the download failed. The sixth line is the error code returned by the **push** command, along with a simple explanation. Note that information in the third line, and the sixth line in case there is an error in download, is provided for support organization's troubleshooting use for cases that messages generated by **push** are not sufficient to pin-point the problems.

The **DOWNLOAD** process is implemented to retry twice after the first download attempt fails. The record for a failed download, or a successful download after the first or the second attempt fails, contains information about each retry.

After **STATUS** is selected, the following is displayed if there are no downloads in progress:

There are no downloads in progress.

If there are downloads in progress:

2 downloads in progress ...

```
Thu Jan 1 15:15:00 EDT 1998: download started
Download Datakit II VCS Release 5.0, Build 53 to nj/blab/oreo/swdliep
====
Thu Jan 1 15:20:00 EDT 1998: download started
Download /usr2/swdl/DK/r5.0/p.5.0.02 to oak/nmsiep,
Can't connect to oak/nmsiep.pupu: Server not answering
Thu Jan 1 15:20:05 EDT 1998: ERROR !!!
Error code: 75 (temp failure; user is invited to retry)
Thu Jan 1 15:21:06 EDT 1998: download restarted
Can't connect to oak/nmsiep.pupu: Server not answering
Thu Jan 1 15:21:07 EDT 1998: ERROR !!!
Error code: 75 (temp failure; user is invited to retry)
Thu Jan 1 15:22:00 EDT 1998: download restarted
====
```

After the status, is presented, the following is displayed:

Do you want to see records in the log file [(y)es, (n)o: (+y)]?

If the response is "n", the process exits. If the response is "y", all records in the software download log file are displayed. For example:

```
Thu Jan 1 13:11:46 EDT 1998: download started.
Download Datakit II VCS Release 5.0, Build 53 to nj/blab/oreo/swdliep
(push nj/blab/oreo/swdliep /usr2/swdl/tmp/24997/stage /dev)
Thu Jan 1 13:41:56 EDT 1998: download completed.
====
Thu Jan 1 13:15:12 EDT 1998: download started.
Download /usr2/swdl/DK/r5.0/p.5.0.33 to oak/nmsiep
(push oak/nmsiep /usr2/swdl/DK/r5.0/p.5.0.33 /fsaux)
Thu Jan 1 13:16:22 EDT 1998: download completed.
====
Thu Jan 1 13:19:46 EDT 1998: download started.
Download Datakit II VCS Release 5.0 Build 53 to nj/blab/chip/swdliep
(push nj/blab/chip/swdliep /usr2/swdl/tmp/24997/stage /dev)
Can't connect to nj/blab/chip/swdliep.pupu: Server not answering
Thu Jan 1 13:19:47 EDT 1998: ERROR !!!
Error code: 75 (temp failure; user is invited to retry)
Thu Jan 1 13:20:47 EDT 1998: download restarted
Can't connect to nj/blab/chip/swdliep.pupu: Server not answering
Thu Jan 1 13:20:48 EDT 1998: ERROR !!!
Error code: 75 (temp failure; user is invited to retry)
Thu Jan 1 13:22:49 EDT 1998: download restarted.
Thu Jan 1 13:55:46 EDT 1998: download completed.
====
```

If \$PAGER is not defined in the user's environment, pg is configured to display the last screen, hence the latest records of the logfile first.

Refer to the HP-UX manuals for more information on using the **pg** command.

The **STATUS** process will report all the downloads, which includes those scheduled downloads, as discussed in **Scheduling Node Software Downloads**, that happen to take place at the time the process is collecting download status.

Report of Available Node Software and Disk Space Usage

The **REPORT** item on the NDSWMGMT Menu is used to report node software that has been loaded to the *StarKeeper II* NMS host and is available for download. In addition, it reports disk space usage.

Node Software Available to Download:

drwxr-xr-x	2	ndswadm	10	1024	Jan 1 11:29	/swdl/DK/r5.0/p.5.0.frm4/
drwxr-xr-x	2	ndswadm	10	1024	Jan 1 11:29	/swdl/DK/r5.0/r.5.0.68/
drwxr-xr-x	2	ndswadm	10	1024	Jan 1 11:22	/swdl/DK/r6.0/p.6.0.4/
drwxr-xr-x	2	ndswadm	10	1024	Jan 1 11:20	/swdl/DK/r6.0/r.6.0.49/

Disk Usage Report:

Filesystem	kbytes	used	avail	capacity	Mounted on
/dev/dsk/c201d5s0	1007351	105986	800629	12%	/swdl

Press **RETURN** to return to the Ndswwgmt menu:

If you are using **REPORT** to get the file/directory name information for **DOWNLOAD**, use the last part, which is contained in the last pair of slashes (/), of the listing in the **Node Software Available to Download** section of the report.

If the free disk space is less than 60 MB, the following warning is displayed:

WARNING! Available disk space is running low: <available disk space>
Please clean up the file system.

Upgrading the Node Configuration Database

Upgrading the node configuration database refers to the process that converts the current node configuration database to the new format that is recognized by the new release. Upgrading to a new release entails both a software change and a database change. The current **dbupgrd** utility available on the node requires the node be rebooted to the stand alone mode. While in the stand-alone shell, existing calls and modules remain active, but new services are unavailable.

You will need to use the node console or *StarKeeper II* NMS's **console** command to reboot the node to the stand-alone mode and to initiate the **dbupgrd** utility. Refer to the node documentation for details.

Node Database Management

The *StarKeeper II* NMS upload/download feature allows you to transfer data between the nodes and the *StarKeeper II* NMS host computer, for backup purposes only. Databases and files can be uploaded from the control computer in a network node to the *StarKeeper II* NMS host; and they can be downloaded from the *StarKeeper II* NMS host to a network node. You can request reports to see if the most recent transfer (or previous transfers) was successful.

⇒ NOTE:

The terms *upload* and *download* can best be visualized by picturing the *StarKeeper II* NMS host above the network's nodes (see Figure 3-4). Regardless of the illustration, upload is always from the node to *StarKeeper II* NMS, and download is always from *StarKeeper II* NMS to the node.

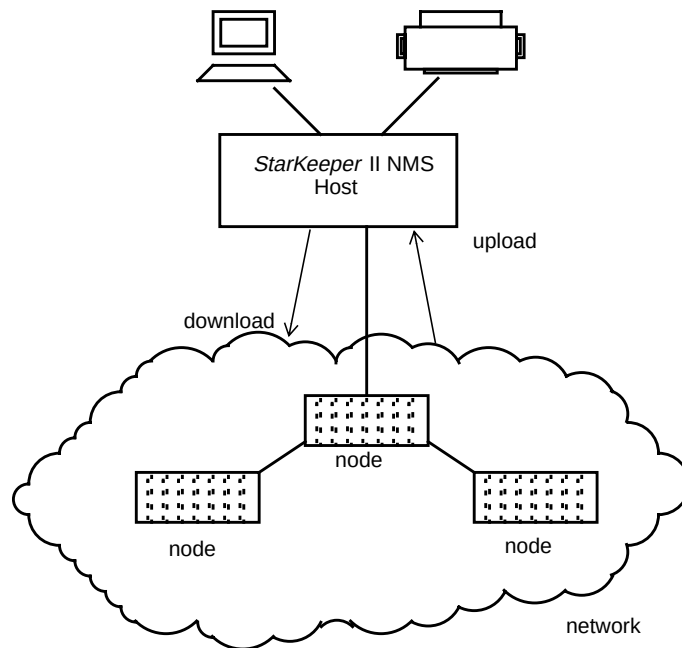


Figure 3-4. The *StarKeeper II* NMS Upload/Download Feature

By uploading a node's database for storage on the *StarKeeper II* NMS disk, you can have an off-network backup copy of this important data, a valuable resource if there is loss or corruption of the database at the node. Also, to ensure that the latest changes to the database of each node managed by the *StarKeeper II* NMS are stored in this backup area, you can schedule regular, automatic database uploads. The other transfers (upload and download of files, and download of a database) are rare occurrences, so there is no reason to schedule them.

A database upload takes several minutes to complete; file uploads take less time. Keep this in mind before asking for status reports (as described in the **Getting Status Reports** section). In the meantime, you can run other tasks since the database upload runs as a *background* process. Refer to your OS documentation if you are not familiar with the definition of a background process. You must wait until any upload or download command has completed its run before specifying another upload or download operation.

Before the upload/download utility can be used, certain information identifying the *StarKeeper II* NMS host to all the nodes must be entered. This is called *upload management* (Procedure 3-20). Also, you have to do some prerequisite tasks before executing the upload/download commands as described in the following section.

Prerequisites

To run the upload/download commands successfully, you must run **skload** or **cfg_sync** (see **Chapter 4**, the section titled **Automated Entry and Synchronization**) to populate or synchronize the node configuration information, particularly the node name, in the *StarKeeper II* NMS database. To verify that this has been successfully completed, enter: **cfv node -N <nodename>** and verify that the fields for local name, local network, local area, and local exchange are populated as they appear in the node database.

Nodes subjected to upload/download must complete a call to the service address of the node's multiplexed host interface board on the *StarKeeper II* NMS host (since the node calls back the host to do the database file transfer). This means that the *dkserver* process must be running on the *StarKeeper II* NMS host, and the status of the CPM board on the node connected to the *StarKeeper II* NMS must show **ACTIVE** and **SERVING**. To verify this on the node, run the node **display connections** command for the CPM board connected to the *StarKeeper II* NMS host and verify that the status is active and serving (using the pass-through feature from *StarKeeper II* NMS). Also, on the *StarKeeper II* NMS host, enter **ps -ef** and determine if the *dkserver* process is running. In addition, you can check the file */var/opt/dk/log/dksrvlog* to determine if the state of the *dkserver* process. For more details on the verification of the interface, see the section titled **Verify Operation of the Host Interface Hardware and Software** in the node's *Host Interface Installation and Administration Guide* for the applicable host machine.

If you are using originating group security on the *StarKeeper II* NMS host and/or the trunks that connect the nodes monitored by the *StarKeeper II* NMS network, you must add the pattern: **?dwnld** to their existing security string, if it is not already defined in the node. If the **?dwnld** pattern is not added, the upload/download process will fail because it cannot make a call from the node to the *StarKeeper II* NMS host. (Refer to the *Node Reference* for details of the **enter address** command.)

Summary of Upload/Download Commands

The upload/download commands are only accessible using the SKsh menu system. To access upload/download commands, enter **SKsh** at the SK: prompt, and choose UPDNLD at the Main Menu to call the UPDNLD Menu, which has the commands as menu selections. A reproduction of the UPDNLD Menu appears in Screen 3-9.

StarKeeper (R) II Network Management System - Selection Menu

Select	Description	Menu: Updnld.	Level: 2
SETUP	Set up or change upload and download environment		
DISPLAY	Display upload and download environment		
UPLOAD	Upload a file or database from a node		
DOWNLOAD	Download a file or database to a node		
STATUD	Status of most recent upload or download		
REPUD	Reports on uploaded files and databases		
CRON	Schedule node database uploads		

Enter a selection (or ?selection for help) and press RETURN

Screen 3-9. UPDNLD Menu

All the upload/download operations are described in the following paragraphs.

Upload Management

Upload management allows you to enter information necessary for the operation of the upload/download feature. Therefore, this operation (Procedure 3-20) must be run before any uploading or downloading is attempted. Do not enter shell meta characters (such as slashes or asterisks) or wild cards in response to any of the prompts.

Procedure 3-20. How to Run Upload Management

1. At the SK: prompt enter **SKsh** choose UPDNLD at the Main Menu, and then choose SETUP from the UPDNLD Menu. (If upload/downloads were run previously, choose DISPLAY for a presentation of the entries used for the previous upload/download; they became the default values for the SETUP operation.)



NOTE:

When setting up base directories for uploaded or restored files, the directory must either exist, or be created in a directory that is writable by the group "sk".

2. You are prompted for the following parameters. If SETUP was run previously, each prompt will contain defaults which can be selected by using the .
 - **The base directory for the uploaded files.** Enter the full pathname of the base directory where the node database(s), or selected file(s), will reside.
 - **The directory for restoring files from tape.** Enter the full pathname of the default base directory where uploaded databases, or selected files, can be restored by the *StarKeeper* II NMS backup and restore utilities. *StarKeeper* II NMS has **skbackup** and **skrestore** commands to expedite these operations; the **-n** option specifies the node name of the uploaded database. Procedures for backing up and restoring the uploaded node database (and other software) are provided in **Chapter 7**, the sections titled **Backing Up Your System** and **Restoring Your Data**.
-  **NOTE:**
- The upload/download feature will not do anything with this default restore directory. It is up to the *StarKeeper* II NMS administrator to rerun SETUP and change the active restore directory if upload/download is to act on a new directory.
- **The service address of the *StarKeeper* II NMS host.** Enter the service address by which all nodes will know the *StarKeeper* II NMS host.
3. The system gives a two-line prompt for the *root* password. Enter the *root* password. If SETUP has been run in the past, it will output the names of any previous base directories for uploaded files.

Uploading a Node's Database

Uploading a node's database makes a copy of the requested node's database (or the databases of all nodes, if specified) and stores it under the specified base directory of the *StarKeeper II* NMS. This provides a backup copy of the database that could then be downloaded to the node if there is a database failure at the node. We recommend you do an upload database whenever a change is made to a node's database.

Procedure 3-21. How to Upload a Node's Database

1. At the SK: prompt enter **SKsh**, choose UPDNLD at the Main Menu, and then choose UPLOAD from the UPDNLD Menu (Screen 3-9).
2. You are prompted for the following parameters:
 - **Node Name.** Enter the name for the node that is to upload its database, or enter **all** if all nodes are to upload their database.
 - **Type of upload.** Specify **database** (or **d** or choose the default.)

After all parameters are input, the upload process responds with the following: Command running in background. Check status with "STATUD" from SKsh.



NOTE:

The **STATUD** command allows you to query the status of the most recent upload or download, and is described later in the **Getting Status Reports** section.

Uploading a File from a Node to *StarKeeper II* NMS

Choosing to upload a node's file makes a copy of the requested node's file and stores it in the specified directory of the *StarKeeper II* NMS. This provides a backup copy of the file that could then be downloaded to the node if desired.

Procedure 3-22. How to Upload a Node's File

1. At the SK: prompt enter **SKsh**, choose UPDNLD at the Main Menu, and then choose UPLOAD from the UPDNLD Menu (Screen 3-9).
2. You are prompted for the following parameters:
 - **Node Name.** Enter the name of the node that is to upload a file, or enter **all** if all nodes are to upload a file having the same name.
 - **Type of upload.** Specify **file** (or **f**)
 - **File name.** Enter the complete pathname of the node file that you wish to upload.

After all parameters are input, the upload process responds with the following: Command running in background. Check status with "STATUD" from SKsh.



NOTE:

The **STATUD** command allows you to query the status of the most recent upload or download, and is described later in the **Getting Status Reports** section.

Downloading a Node's Database

Downloading a node's database takes a saved copy of the specified node's database and installs it on the specified node. The operation is used in emergency conditions to restore a corrupted database. An optional warm reboot of the node then initializes the restored database.

Procedure 3-23. How to Download a Node's Database

1. At the SK: prompt enter **SKsh**, choose UPDNLD at the Main Menu, and then choose DOWNLOAD from the UPDNLD Menu (Screen 3-9).
2. You are prompted for the following parameters:
 - **Node Name.** Enter the name for the node that is to receive the download of the database or enter **all** if all nodes are to receive the database.
 - **Type of download.** Specify **database** (or **d**) or choose the default.
 - **Reboot query.** A query on whether to reboot the node after a successful download. (A reboot is required to make the database active.) See the following note.

NOTE:

You may want to download but not reboot; for instance, you may want to do a Release conversion of the database on the node but not make it active until you do some other task on the node. Once you and the node are ready, do a warm reboot. See the node manuals for details.

After all parameters are input, the download process responds with the following: Command running in background. Check status with "STATUD" from SKsh.

Downloading a File from *StarKeeper II* NMS to a Node

Downloading a file takes a saved copy of the specified file and installs it on the specified node.

Procedure 3-24. How to Download a *StarKeeper II* NMS File

1. At the SK: prompt enter **SKsh**, choose UPDNLD at the Main Menu, and then choose DOWNLOAD from the UPDNLD Menu (Screen 3-9).
2. You are prompted for the following parameters:
 - **Node Name.** Enter the name for the node that is to receive the downloaded file. Enter **all** if all nodes are to receive the file.
 - **Type of download.** Specify file (or **f**).
 - **SK file name.** Give the complete path of the *StarKeeper II* NMS file that is to be downloaded.
 - **Target file name.** Give the complete path where the file is to go to (on the node). The number of characters in the complete path for the *StarKeeper II* NMS file name *plus* the path of the target file name added together should not exceed 65 characters. If it does, copy the *StarKeeper II* NMS file to another directory; (for example, */tmp*) so that the new pathname (*/tmp/filename*) together with the target file pathname will not exceed 65 characters.

After all parameters are input, the download process responds with the following: Command running in background. Check status with "STATUD" from SKsh.

Getting Upload/Download Status Reports

You have access to the various upload/download status files by choosing STATUD and REPUD from the UPDNLD Menu (Screen 3-9). STATUD produces a report on the most recent execution of the upload or download command. The report specifies what nodes were involved and whether the transfer was successful. REPUD produces an historical report on upload and download transfers to a specified node. If the last transfer was successful, it is the only transfer you will see; however, if the last transfer was unsuccessful, all unsuccessful transfers are shown.

The STATUD Report

To retrieve information about the most recent execution of UPLOAD or DOWNLOAD, enter **SKsh** at the SK: prompt and choose UPDNLD from the Main Menu, then choose STATUD from the UPDNLD Menu (Screen 3-9). A typical response is shown in the following screen, where the status of an upload from two nodes (the "all" option to the UPLOAD choice) was attempted. The report shows one node successfully completed the upload and the other did not.

STATUS FOR UPLOAD DATABASE		

NODE:	west/garden/gold	
DATE/TIME	01/01/98	20:01:05
STATUS	SUCCEEDED	

NODE:	national/east/forest/model	
DATE/TIME	01/01/98	20:08:17
STATUS	FAILED-node does not know the SK service address	

Screen 3-10. Typical STATUD Report



NOTE:

If you choose STATUD while the upload or download is still running, you will receive a message to that effect.

The REPUD Report

To retrieve historical information about the upload and download status for specified nodes, choose REPUD from the UPDNLD Menu (Screen 3-9). Choosing REPUD only reports on transfers to/from the selected node. See the following procedure. When a transfer is unsuccessful, it appends to the report; when the transfer is successful, it deletes all previous entries.

Procedure 3-25. How to Get Upload/Download Reports on a Specified Node

1. Enter **SKsh** at the SK: prompt, choose UPDNLD at the Main Menu, and then choose REPUD from the UPDNLD Menu (Screen 3-9).
2. You are prompted for the following parameters:
 - **Node Name.** Enter the name to identify the node that you want to access for a report (or enter *all*).
 - **Upload or download.** Specify whether you want a report on the node's uploads or downloads.
 - **Object type.** Specify whether you want a report for databases or individual files.

A typical response is shown in the following screen, where the status of two database uploads from the node "silver" are reported. The results show one upload was successfully completed and the other was not.

```
-----
                        STATUS FOR UPLOAD DATABASE
-----
NODE:      west/garden/silver
DATE/TIME  01/01/98      09:01:05
STATUS     SUCCEEDED
-----
NODE:      west/garden/silver
DATE/TIME  01/01/98      20:02:17
STATUS     FAILED-node does not know the SK service address
```

Screen 3-11. Typical REPUD Report

If the last operation (that is, upload database) was successful, only that success is shown. If the last operation was unsuccessful, then all unsuccessful attempts are shown. Every successful attempt for a particular operation on a particular node erases all previous successful and unsuccessful attempts. If an attempt fails, nothing is erased.

Error Messages

Error messages that the upload/download process can recognize go to the user's screen. Other error messages, which occur when the process is running in the background, go to the status files; they are accessed through the STATUD and REPUD choices on the UPDNLD Menu (Screen 3-9).

The error messages associated with the upload/download process, and an analysis of each message, are provided in **Appendix I**.

Scheduling Database Uploads

You can schedule the upload of node databases for execution on a regular basis.



NOTE:

Upload and download of single files are for node software transfers; as such, they are exceptional events that you will not schedule. Database download also is an exceptional event, used only to replace lost data or to execute a software upgrade, and so it too is not scheduled.

Procedure 3-26. How to Schedule an Upload of a Node(s) Database

1. Enter **SKsh** at the SK: prompt, choose UPDNLD at the Main Menu, and then choose CRON from the UPDNLD Menu (Screen 3-9).
2. Follow the prompts for the pathname to the SK base directory and the *StarKeeper II* NMS release number. The screen will show a list of operations (Screen 3-12). Operation 1 is defined as "upload node database." Enter **1**.

Enter the Operation you want to perform:

- 1 upload node database
- 2 cancel upload of node database
- 3 make crons
- 4 verify crons

Screen 3-12. Scheduling Database Upload Operations

3. You are prompted for the following parameters:
 - **Node Name or "all"**. Enter the complete pathname for the node. To upload the configuration database from all nodes, enter **all**.
 - **Hour of day**. Enter the hour of the day (0-23) for the scheduled upload.
 - **Minute of hour**. Enter the minute (0-59) of the specified hour for the scheduled upload.
 - **Day of month**. Enter the day of the month (1-31) for the scheduled upload. Enter **all** for every day.
 - **Month of year**. Enter the month of the year (1-12) for the scheduled upload. Enter **all** for every month.
 - **Day of week**. Enter the day of the week (0-6, where 0=Sunday) for the scheduled upload. Enter **all** for every day.
4. After completing the scheduling information you are returned to the Operations screen (Screen 3-12).
5. Choose **make crons**, operation 3.

⇒ NOTE:

"Cron" is an abbreviated form of chronological. The term is related to the OS **cron** command that allows for scheduled command execution. Refer to the **cron(1)** and **crontab(1)** entries in the OS manuals for complete coverage.

Canceling a Database Upload

If you just want to *remove* (cancel) the automatic, scheduled upload, complete the following procedure. If you want to *change* the schedule for database uploads, you must cancel them first (Procedure 3-27) and then reschedule (Procedure 3-28).

Procedure 3-27. How to Cancel a Scheduled Upload of a Node(s) Database

1. Enter **SKsh** at the SK : prompt, choose UPDNLD at the Main Menu, and then choose CRON from the UPDNLD Menu (Screen 3-9).
2. Follow the prompts for the pathname to the SK base directory and the *StarKeeper II* NMS release number. The screen will show a list of operations (see Screen 3-12). Choose operation 2, cancel upload of node database.
3. You are prompted for the following parameters:
Node Name or "all". Enter the complete pathname for the node or enter **all** to remove scheduled database uploads that were scheduled using the "all" option.

If a cron entry exists for the given node, it is deleted and you are instructed to run **make crons** (operation 3) once again.

⇒ NOTE:

You need to know the password for *root* to make or verify crons.

Example Database Upload Scenario

For illustration purposes, we will go through a sample database upload using the facilities of the *StarKeeper II* NMS Upload and Download Utility.

Procedure 3-28. Database Upload Example

1. Ensure all steps in the **Prerequisites** section were accomplished.
2. Log into the *StarKeeper II* NMS host as *cnmsadm*.
3. Using OS commands, at the host prompt, make a base directory to receive the uploaded database(s), for example, */usr2/cnmsadm/dkdb*s.

4. Make a default base directory for restoring files, such as */usr2/cnmsadm/dkdbbs.rest*.
5. From the *StarKeeper II* NMS shell, use the **cfenter** command or the SKsh menu system to specify the correct node names (full pathnames) and the node software Release number. Verify the entries with the **cfverify** command. Refer to **Chapter 4**. For our example, we have two nodes; one is *west/garden/gold* and the other is *west/garden/silver*. The *StarKeeper II* NMS for this example is *west/garden/star1*.

To run the upload/download commands successfully, you must run **skload** or **cfg_sync** (see **Chapter 4**, the section titled **Automated Entry and Synchronization**) to populate or synchronize the node configuration information, particularly the node name, in the *StarKeeper II* NMS database.

6. Run upload management (Steps 6a through 6d). This operation is only done once; later uploads and downloads may skip this step.
 - a. At the SK : prompt enter **SKsh**, choose UPDNLD at the Main Menu and choose SETUP at the UPDNLD menu (see Screen 3-9).
 - b. At the prompts, provide the directory data for the uploaded files, for example:

base directory for files: */usr2/cnsmadm/dkdbbs*
default directory for restoring files: */usr2/cnmsadm/dkdbbs.rest*
service address for SK host: *west/garden/star1*
 - c. Enter the *root* password.
 - d. Choose DISPLAY from the UPDNLD menu to verify the parameters entered in Step c.
7. Run the UPLOAD database command.
 - a. Choose UPLOAD at the UPDNLD Menu (Screen 3-8).
 - b. At the prompts, provide the addressing data for the specified databases, such as:

node name: *all*
type of upload: *d*
8. You will receive the following message after making the last entry:
Command running in background. Check status with "STATUD" from SKsh.
9. After running other tasks for a minute or so, check the success of the database upload, by choosing STATUD from the UPDNLD Menu.

10. A report similar to the one in the next screen appears:

```

                        STATUS FOR UPLOAD DATABASE
-----
NODE:      west/garden/gold
DATE/TIME  01/01/98      20:01:05
STATUS     SUCCEEDED
-----
NODE:      west/garden/silver
DATE/TIME  01/01/98      20:02:17
STATUS     FAILED-node does not know the SK service address

```

Screen 3-13. Example STATUD Report

11. Analyzing the report, the database upload from the node gold was successful, but the one from the node silver failed because the node did not know the *StarKeeper* II NMS service address. Make sure the proper service addresses are entered into the nodes so that they can reach the *StarKeeper* II NMS host.
12. For some more data you can run a report on the node silver by using the REPUD choice from the UPDNLD Menu.
 - a. Choose REPUD from the UPDNLD Menu.
 - b. At the prompts, provide the data for the specified node, for example,
 node name: **silver**
 upload or download: **upload**
 Object type: **database**
13. A report from the specified node appears, such as in the following screen.

```

                        STATUS FOR UPLOAD DATABASE
-----
NODE:      west/garden/silver
DATE/TIME  01/01/98      09:08:19
STATUS     SUCCEEDED
-----
NODE:      west/garden/silver
DATE/TIME  01/01/98      20:02:17
STATUS     FAILED-node does not know the SK service address

```

Screen 3-14. Example REPUD Report

14. Analyzing the report, you can see a confirmation that the database upload from the node silver failed; however, a month previously (in January) a database upload from the same node was successful. The error message: FAILED - node does not know the SK service address perhaps indicates the node silver no longer has the *StarKeeper* II NMS service address in the database. The *StarKeeper* II NMS service address must be reentered into the node database; use the node **enter address** command.

Security

The subject of security is, primarily, an OS issue. It includes password security, writing secure programs, file and directory permissions, methods of data encryption, security auditing, and network security. Refer to documentation on the OS.

The next subsection discusses setting and changing the Console Security Password for the nodes. Also, *StarKeeper II* NMS allows you to limit the commands that users can access. See the subsection, **Command Partitioning**, for complete instructions on partitioning commands for users.

Console Password

The network administrator establishes a security password for the console connection and the alarms connection (if used) on all nodes; the same password also must be entered into the *StarKeeper II* NMS database using **cf** commands (the enter operation for a System/Node). To change the console password, follow these steps:

1. Make the console connection inactive using the **cf** commands (**cfchange**).
2. Change the password *at the node* using the **change node** command.
3. Change the password in the *StarKeeper II* NMS database using the **cf** commands (**cfchange**).
4. Make the console connection active for that node using the **cf** commands (**cfchange**).

Command Partitioning

The Command Partitioning feature gives the administrator the ability to allow (and deny) other users (or customers) access to certain *StarKeeper II* NMS and node commands. Each customer is known as a *Partitioned User*. When Partitioned Users log onto the system they can access only those commands that you assigned to them.



NOTE:

Partitioned users are created to run under the restricted shell, which is not supported under HP-VUE. It is therefore not possible for partitioned users to login through HP-VUE.

If a partitioned user is to login on a console with a HP-VUE login screen in display, he or she must first click on the Options button to select the "no windows" option. After that option is confirmed, the user will see a regular UNIX login prompt replacing the HP-VUE login screen. The user can then login to perform the authorized tasks. This also implies that partitioned

users will not be able to use all the HP-VUE related graphics capabilities on the console. Partitioned users can still login through "cut-through" or through a non-graphics terminal.

The Command Partitioning feature is designed to be a convenient tool for the network administrator to grant limited access to other users on the system. However, it is important to note that it is neither designed nor intended to be a secure tool. For example, special checks are not implemented to prevent the users from circumventing the imposed restrictions.

The commands you allow (and those you deny) are as you deem appropriate for the users and the network. The usual procedure is to deny a Partitioned User the commands that allow them to change the database or other sensitive areas of *StarKeeper II* NMS. This includes the **SKsh**, **pi**, **skbackup**, **skrestore**, **skload**, **cfg_sync**, **cfscript**, **cfgload**, **sk_sync**, **conn_sync**, and **cf** commands (except for **cfverify**).

⇒ NOTE:

A Partitioned User cannot be a Graphics System user, and therefore, cannot access any system application.

Command Partitioning Administrative Commands

To create a Partitioned User, you must use a set of commands known as *Administrative Command Partitioning Commands*; they are listed in Table 3-3. Enter the commands at the prompt and you will be prompted for the *root* password for the first command. Refer to Table 3-3 for a list of the commands that require *root* access and those that do not.

The Command Partitioning Commands are listed in the following sections. Observe the use of capital and lowercase letters in the command names. Run the on-line help for complete coverage.

Table 3-3. Command Partitioning Commands (Administrative)

The following six commands require that you enter the *root* password.

Command	Description
DefineUser	Creates a <i>Partitioned User</i> login. This command is the first one used in the Command Partitioning process. Once defined, the user has a login, but no access to any commands yet.
Permit	Specifies the <i>StarKeeper II</i> NMS and network node commands that the user is allowed to use. The command function prompts you first for the user login, and then for the commands you will allow the user to use.

Command	Description
Deny	Removes a <i>StarKeeper II</i> NMS or network node command that was previously assigned to a Partitioned User. The Deny command undoes what the Permit command previously did. (If you never granted a user explicit permission for a particular command, you do not have to Deny it to them—they simply do not have it.)
Custreports	Allows a Partitioned User access to a subset of performance measurements and billing reports; they are listed below. Also see the Reports for the Partitioned User section. 1. billing: activity, admin_call, call_hold, summary, x25, x25p, x75 2. performance: bisync, concentrator, cpmml, dkap, frm, frm-m2, host, node, sam, samml, sdlc8, trkgrp, trunk, tsm8, x25, x75
PrntOpt	Allows the Partitioned User to print performance and billing reports either directly to a local printer or sent to the user's site and saved on-line. See the Reports for the Partitioned User section.
RemoveUser	Removes a Partitioned User's login previously created by the DefineUser command.

The following three commands do not require the *root* password. They are available from the shell for any user.

Command	Description
User	Lists all Partitioned User logins created by the DefineUser command.
Printall	Lists all available <i>StarKeeper II</i> NMS and network node commands that can be assigned to the Partitioned User.
Print	Lists all <i>StarKeeper II</i> NMS and network commands assigned to a Partitioned User.

If the Partitioned User's reports were saved on-line, the administrator and Partitioned User should monitor the disk space on the *StarKeeper II* NMS host. Reports tend to be large. If they are not cleaned up occasionally, disk space on the *StarKeeper II* NMS host will diminish considerably. The Partitioned User may use the command called **pr.remove** to delete old reports.

Command Partitioning User Commands

The following table lists the Command Partitioning user commands that may be assigned to the user through the **Permit** command in addition to the regular *StarKeeper* II NMS and node commands.

The network administrator will not always be available to handle customer problems or requests. The command partitioning commands, shown in the table below, are designed to shift some responsibility to the end user. They can be assigned to the end user through the **Permit** command.

Table 3-4. Command Partitioning Commands (Partitioned User)

Command	Description
Motd	Changing the message of the day (Motd) on a node is simple and need not be the sole responsibility of the administrator. Through this command, customers can alter the daily message to suit their own needs without taking any more of the administrator's time.
Diagvdm	Diagnoses Integrated Voice/Data Multiplexers. In this way, if the administrator must be called in, the end user will already have valuable diagnostic data from which to proceed, thereby saving more of the Administrator's time.
Rmres	Removes and restores a TY module and channel.
Print	Lists all <i>StarKeeper</i> II NMS and network commands assigned to a Partitioned User.

Run **help** for a description of these commands.

Creating Partitioned Users and Configuring Their Printers

The Partitioned User is identified with the **DefineUser** command and the commands at their disposal are assigned using the **Permit** command. Refer to Procedure 3-29 for instructions on creating a login account for the typical Partitioned User.

If a user is allowed to generate reports, **PrntOpt** must be used to assign either the default line printer configuration, or the "remote" configuration. With the default line printer configuration (option 1), the user will route generated reports directly to a screen or the local line printer. With the "remote" configuration (option 2), users will have their generated reports stored directly on line. These can be retrieved at any time.

If a user is allowed to generate reports, and the reports are restricted, the **Custreports** command will assign all restricted billing and performance reports to the Partitioned User.

Refer to Procedure 3-30 for instructions on assigning reports and printers to a Partitioned User.

Procedure 3-29. How to Create a Partitioned User

1. Enter **DefineUser** at the prompt.
2. You are prompted for the user's login name. Enter it.
3. You are prompted for the base directory for the user's login name. Enter it. For example, if you enter **/usr2** at this prompt, the Partitioned User's home directory will be **/usr2/<login>**.
4. You are prompted for the user's password. Enter it. You will be prompted to reenter the password. Enter it again.
5. You are prompted for the user's numeric identifier. Enter the identifier using a number between 100 and 50000.
6. Enter **Permit**.
7. Follow the prompts and specify the *StarKeeper II* NMS and/or node commands you wish to assign to the Partitioned User. Refer to Procedure 3-30 to assign report accessibility for a Partitioned User.
8. When you are finished, press without specifying a command.
 - If you want the identity of the Partitioned Users, enter **User** and follow the prompts.
 - To remove a Partitioned User from the system, enter **RemoveUser** and follow the prompts.
 - To remove a certain command from a Partitioned User's list of assigned commands, enter **Deny** and follow the prompts.

Reports for the Partitioned User

The administrator can allow the Partitioned User to access reports. If you want the User to have access to all the reports, then use the **Permit** command to grant the Partitioned User access to the **report** command. However, if you want the Partitioned User to be able to access only a certain set of restricted reports, you must use the **Custreports** command (see Procedure 3-30 for instructions).

The administrator also must assign to the Partitioned User the method of printing out reports. There are two ways that a Partitioned User can print out reports: directly to a local screen or printer or have the reports saved on-line (to be viewed later on the terminal screen or sent to a printer). Nonrestricted reports can be sent directly to a screen or printer that is local to the *StarKeeper II* NMS host. Restricted reports can be sent to the screen or a local printer, or they can be saved on-line. If the reports are saved on-line, the Partitioned User can print them out on the terminal screen or on a line printer at a later time.

Use the **PrntOpt** command to choose a printout method for the Partitioned User. The **PrntOpt** command will query you for the printout option. Option 1 is for the direct printout and Option 2 directs the report to the user's terminal.

When an on-line report is generated, the report is labeled as "r.<sequential number>." The numbers grow in sequential order as each report is processed. These reports are stored in the Partitioned User's *\$HOME/.report* directory. To manipulate these reports, the Partitioned User has access to three commands: **pr.report**, **pr.list**, and **pr.remove**. Refer to Table 3-5 for a brief description of the commands. These commands are automatically assigned to the Partitioned User once the administrator executes **PrntOpt** and assigns option 2 to the Partitioned User.

Table 3-5. Partitioned User Report Commands

Command	Description
pr.list	Lists the report number and the first few lines of each available report found in the Partitioned User's <i>\$HOME/.report</i> directory.
pr.report [-d] <report_number>	Prints the selected report on the user's terminal. The -d argument is optional. It means "store the report on the disk." If you do not specify -d , the report is presented on the screen but it is not saved on-line.
pr.remove <report_number>	Removes a specified report from the Partitioned User's <i>.report</i> directory.

Procedure 3-30. How to Assign Reports and Printers to a Partitioned User

1. Enter **PrntOpt**.
2. You are prompted for the Partitioned User's login name; enter it. If the Partitioned User has access to all reports complete Step a; however, if the Partitioned User has access only to selected reports (as assigned by the **Custreports** command) complete Step b.
 - a. **For all reports** (nonrestricted): you will be queried for the type of printer configuration. You can only enter a **1** which sends generated reports to the screen or local printer.
 - b. **For selected reports** (restricted): you will be queried for the type of printer configuration. Choose **1** to send generated reports to the screen or local printer; or choose **2** for on-line storage of the reports.
3. Choose if the Partitioned User will have access to *all* reports (complete Step 4) or *selected* reports (complete Step 5).

4. If the Partitioned User is to have access to **all reports**:
 - a. Enter **Permit**.
 - b. You are prompted for the Partitioned User's login name; enter it.
 - c. You are prompted for the allowed command; enter **report**.
 - d. To exit entry mode, press without specifying the allowed command.
5. If the Partitioned User is to have access to **selected reports**:
 - a. Enter **Custreports**.
 - b. You are prompted for the Partitioned User's login name; enter it.
 - c. The system confirms that the specified user has access to customized reports.

Automating Routine Tasks (the sequence Command)

Many network commands (for example, those in the BNS-2000 or BNS-2000 VCS command set) are only available in prompted-entry mode. Normally, this is not a problem; however, it can become tedious when you have many repetitive entries to make using one command. An example would be when an **enter ty** command would have to be done 12 times (for 12 ports) on one module. However, to automate responses to repetitive, prompted-entry commands *StarKeeper II* NMS provides a command called **sequence**. Using the **sequence** command, you write predefined scripts (patterns files) that automatically answer queries coming from the node. (For example, FRM's **nping** command uses the *StarKeeper II* NMS **sequence** command to run diagnostics.) To use the **sequence** command, precede a node command with the **sequence** command, a node name, and a patterns file name. The specified command fields, or prompts, are filled in automatically with the data you place in the patterns file.

In order to create a *patterns file*—the file that contains the command routines you need—you must identify the following:

- the prompts for the node command you are using.
- a unique substring of characters for each prompt in the node command.

This information can be located in the node documentation for your network, or by entering the node command and viewing its prompts on your screen.

Before you begin, you will need to know the syntax for the **sequence** command, and how to create a patterns file. Run **help** for a detailed description of the **sequence** command. Refer to the following paragraph for instructions on creating a patterns file.

⇒ NOTE:

Some node commands can be fully defined as one-line commands; and therefore, do not involve answering prompts. Use the *pass-through* feature to identify the node.

The Patterns File

A patterns file consists of up to 500 lines. Each line contains three entries separated by TAB characters (>):

string (> instruction (> iteration

where:

string is a unique substring for the prompt. The first entry in the patterns file would be a substring that is unique to the first prompt of the command. Selecting a unique pattern is explained further in the sequence example in the next section.

instruction is the instruction that you want as input at that prompt. It is what you would enter after the prompt if you were manually executing the node command.

iteration is the number of times you want the pattern to perform the same instruction. The default is 1 and requires no entry in the iteration position. If another number is in that position, the command will step through the particular instruction that number of times.

⇒ NOTE:

There are three reserved words with special meanings in a patterns file:

ABORT If the pattern in column 2 of the patterns file is **ABORT**, the **sequence** command terminates its conversation with the node.

CR_RETURN **CR_RETURN** is used for node prompts to choose the node command default option for that prompt. This reserved word may be used in the second column of the patterns file. You can also use a plus sign (+) to select the default option.

DELETE **DELETE** is used for node command prompts to issue a  character to the node to display the next prompt.

Regular Expressions

The Operating System's (OS) shell regular expressions can be used for the instructions in the patterns file; however, you must precede them with backslashes. The regular expression characters are:

[] * . ^ + { } ()

Environment Variables

In many cases you will want your patterns files to be flexible enough to be used for more than one specific task. You can do this by using environment variables in the patterns file. To make an environment variable, precede it with a **\$** in the patterns file, as shown below:

```
string $ADDRESS iteration
```

In addition, precede the **sequence** command with a variable declaration on the command line, for example,

```
ADDRESS=20 sequence -f <pattern_file> -v -n <node_name> <node_command>
```

⇒ NOTE:

The "underscore" character (**_**), cannot be used in environment variable names that appear in the patterns file. For example, the following entry in a patterns file is *incorrect*:

```
NAME $NAME_STRING 1
```

The correct entry of environment variable usage is

```
NAME $NAMESTRING 1
```

sequence Command Procedure

The Steps for correctly using the **sequence** command are in Procedure 3-31. Following this procedure are two examples. The first uses a simple node command to teach the basics of the **sequence** command and is presented in paragraphs with sub-headings that key you to the Steps in Procedure 3-31. The second example is more complex and teaches some of the intricacies of the command.

Procedure 3-31. Sequence Command Procedure

1. Select the node command you want to execute.
2. Identify all the prompts that appear when the command is executed. You may wish to execute the command, or consult the node documentation.
3. For each prompt, identify a unique substring of characters for each prompt in the command. Write these down, as they will be needed when you create the patterns file.
4. Create a patterns file using either of the OS text editors, *ed* or *vi*.
5. Test the patterns file by executing the **sequence** command with the selected node command and patterns file.

When executing a sequence and you see the following message:

```
SCP has detected an error in communication with doorway.  
Could not send the disconnect requests.
```

This message is displayed if the **sequence** command is not responding to the node queries correctly, or the timeout interval is too short. Check the command file against the execution output to ensure every node query response is correct. Usually, the **sequence** command responds incorrectly to the node query right before this message is displayed. Modify the command file with appropriate responses to the node queries. If the timeout interval is too short, use the **-I** or **-L** option to increase the timeout interval.

First sequence Command Example

The following example shows the use of the **sequence** command with the node command **dstat**. (Automating the **dstat** node command would be used to interrogate the node to determine the status of a module; the module would be specified in **\$MOD**.) System responses will vary slightly depending on the node and release you are using. The same procedure can be used for any node command.

Select Node Command

Select the node command you wish to automate using the **sequence** command. As stated, the node command used in this example is the **dstat** command.

Identify Prompts

Identify all the prompts issued by the node command. You can reference the command in the node documentation, or enter it at the terminal as follows:

```
<node_command_name>
```

The node display for the **dstat** command is as follows:

```
CC0> dstat  
OBJECTS [ai, ..., x75]:  
MODULE ADDRESS:  
DETAIL [low, high: (+low)]:
```

Identify Unique Prompt Strings

The **sequence** command will try to match user-defined strings with the data received from the node. In the above example, the strings **OBJ**, **MOD**, and **DET** would uniquely identify each line.

Creating a Patterns File

The patterns file for the command is a text file that contains a line for each prompt. Each line contains the string, instruction, and iteration data, separated by tabs. The strings were identified in the previous step. The names of the applicable pattern file is *dispstat.patt*.

The sequence pattern file for the **dstat** (*dispstat.patt*) command is shown below.

OBJ	mod
MOD	\$MOD
DET	Low

The above tells the **sequence** command to look for a prompt that has the string **OBJ** and respond with the string **mod**. The second line will respond with the current value of \$MOD. Tab characters separate the two columns.

Testing the Patterns File

To test the patterns file (*dispstat.patt* file), you must set MOD to a value, export it, and enter the **sequence** command, as shown below:

```
MOD=5 export MOD; sequence -nmynode -fdispstat.patt -v dstat
```

The **-v** (for verbose) option will display the prompting session as it happens.

⇒ NOTE:

Always provide as many options on the command line as possible. In the above example, if you know you want to do a **dstat mod**, remove the **OBJ mod** line from the patterns file *dispstat.patt*, assure MOD is set to a specified value, and add **mod** to the command line; for example, enter.

```
sequence -nmynode -fdispstat.patt -v dstat mod
```

Executing the Sequence Command

To execute the **sequence** command for the **dstat** node command, assure MOD is set to a specified value and enter:

```
sequence -f <filename> -v -n <nodename> dstat
```

where:

<filename> is the file name of the sequence pattern file for the **dstat** command.

<nodename> is any node name designated.

An example command output for the **dstat** command is as follows.

```
CC0> dstat
OBJECTS [ai, ..., x.75]: module
MODULE ADDRESS: 5
DETAIL [low, high: (+low)]: h
```

Second sequence Command Example

The **dstat** discussion was an example of a simple prompting sequence. The following examples illustrate more complicated prompting sequences, and illustrate error handling and looping techniques.

Duplicate Prompts

Consider the node prompts for the **enter group** command:

```
CC0> enter group
GROUP [up to 8 chars]: newgrp
TYPE [local, trunk: +(local)]:
DIRECTION [originate, receive, 2way]: 2
DEVICE OR HOST [up to 8 chars]: host123
PASSWORD [up to 8 chars, none: +(none)]:
ROUND ROBIN SERVICE [per_port, per_module, none: +(none)]:
GROUP [up to 8 chars]:
```

Note that GROUP is repeated. There is nothing unique about these lines. Therefore, if the patterns file had a line such as

```
GROUP $GROUP
```

it would cause the system to hang since the node would be waiting for a response to the second GROUP prompt. Note that the **sequence** command, unless told otherwise, will use a prompt response only once. In the above example, it would be desirable to exit the **sequence** command when the second **GROUP** prompt is received. The mechanism to use here is the **ABORT** response as shown in the following patterns file for the above **enter group** command. Also note the use of the plus sign (+), which selects the default option presented in the node prompts.

```
GROUP $GROUP
TYPE local
DIRECT 2way
DEVICE device1
PASS +
ROUND +
GROUP ABORT
```

The above **ABORT** response is a controlled exit from the **sequence** command.

Error Handling

So far we have been assuming that the node does not produce any error messages. In the above example if the group name in **\$GROUP** was newgrp and newgrp was already defined, the node would respond with

```
GROUP [up to 8 chars]: newgrp
INPUT ERROR: Group Already Exisits: newgrp
GROUP [up to 8 chars]:
```

The node is now waiting for a second entry of the group name. In the above example, the **GROUP ABORT** will be used. Therefore, the **sequence** command would have exited the same way for both normal and abnormal conditions. It would be preferred in this case to exit with an error indication. (The error message from the node would only be seen if the **-v** option is set.) The way to generate an error return from the **sequence** command is via the **ABORT** instruction as follows:

```
GROUP $GROUP
ERROR ABORT
TYPE local
DIRECT 2way
DEVICE device1
PASS +
ROUND +
GROUP ABORT
```

Looping

The above example shows how a duplicate prompt (GROUP) can be used to terminate the **sequence** command (via the **ABORT**). There are cases, however, when it is desirable to respond to duplicate prompts with the same or different data. The above patterns file can be modified to enter two groups into GROUP1 and GROUP2. In both cases, however, the remaining data will be the same for both groups since the iteration is specified as 2 for the prompts. The patterns file is as follows:

```
GROUP $GROUP1
GROUP $GROUP2
ERROR ABORT
TYPE local      2
DIRECT 2way     2
DEVICE device1  2
PASS +         2
ROUND +        2
GROUP ABORT
```

Using the sequence Command from the OS Shell

You can use the *StarKeeper* II NMS **sequence** command from a shell program to further automate interaction with the node. The basic procedure is the same, except that you must create a shell program to define variable names, or prompt you for them, and execute the **sequence** command.

This section provides an example of using the **sequence** command from a shell program. Once again, the **enter group** command is used to enter group names in the NODE1 database. This time however, the group name field of the prompts is made *variable* by defining it as a shell variable in the code. Variables defined in the shell program must have a **\$** before them in the patterns file. This example defines the NODE name in the shell program. Using shell variables makes it easier to reuse the patterns file so it can be used again to enter groups into the database.

For example, this program can be changed to define groups on another node by changing the line that says: **NODE=NODE1** and the line that says: **GROUPS="group1 group2 group3"** to the desired node and group names.

NOTE:

The shell variables used with the sequence script must be exported in the shell.

Patterns File

The patterns file used in this example is called *grp.patt*:. Refer to the prompting sequence for the **enter group** command just discussed in the heading titled **Duplicate Prompts**.

GROUP	\$GROUP
ERROR	ABORT
TYPE	local
DIRECT	2way
DEVICE	device1
PASS	+
ROUND	+
GROUP	ABORT

Shell Program

The name of the shell program in this example is *group.sh*:

```
# Group variables
export GROUP GROUPS

# Name of the node to enter the groups on
NODE=silver

# The group names
GROUPS="group1 group2 group3"
for GROUP in `echo $GROUPS`
do
    echo "*****"
    echo ">>>> Entering group $GROUP..."
    sequence -f grp.patt -v -n $NODE enter group
    echo "*****"
    sleep 4
done
```

Running the Shell Program

The shell program must be in an executable file. You can run it by typing its name following the shell prompt:

group.sh

Program Output

The shell program invoked the **sequence** command with the **-v** (verbose) option.
The option displays all the output from the command as it is executed at the node:

```
SK: group.sh
*****
>>>> Entering group group1...
> enter group
GROUP [up to 8 chars]: group1
TYPE [local, trunk: +(local)]: local
DIRECTION [originate, receive, 2way]: 2way
DEVICE OR HOST [up to 8 chars]: device1
PASSWORD [up to 8 chars, none: +(none)]: +
ROUND ROBIN SERVICE [per_port, per_module, none: +(none)]: +
Creating New Host: device1

GROUP [up to 8 chars]:
ABORT
*****
*****
>>>> Entering group group2... > enter group
GROUP [up to 8 chars]: group2
TYPE [local, trunk: +(local)]: local
DIRECTION [originate, receive, 2way]: 2way
DEVICE OR HOST [up to 8 chars]: device1
PASSWORD [up to 8 chars, none: +(none)]: +
ROUND ROBIN SERVICE [per_port, per_module, none: +(none)]: +

GROUP [up to 8 chars]:
ABORT
*****
*****
>>>> Entering group group3...
> enter group
GROUP [up to 8 chars]: group3
TYPE [local, trunk: +(local)]: local
DIRECTION [originate, receive, 2way]: 2way
DEVICE OR HOST [up to 8 chars]: device1
PASSWORD [up to 8 chars, none: +(none)]: +
ROUND ROBIN SERVICE [per_port, per_module, none: +(none)]: +

GROUP [up to 8 chars]:
ABORT
*****
*****
SK:
```

Other Applications

The example in the previous sections show how you can use **sequence** with the **enter group** node command. Any node command can be used from the shell program that calls the **sequence** command, and any of the prompts can be made variable in the patterns file.

Another node command that can be used from the shell program and calls the **sequence** command is the **nping** command. This command executes the **diagnose node** command with the diagnostic test option **nping**. The **nping** command sends a ping on any Frame Relay PVC in the network to measure network round trip delay. Run **help** for a full description of this command.

Using the Programmer's Interface

The Programmer's Interface provides a command, **pi**, to create programs that act on alarm messages. This section describes how application programs in the OS shell or C language can be activated when *StarKeeper II* NMS receives messages you specify using the Programmer's Interface capability. These programs can display or manipulate the fields contained in a message and perform a wide variety of functions. A detailed example illustrates the procedure for using the Programmer's Interface. In addition, useful programs with explanations are provided. **Appendix H** describes the fields contained in node and *StarKeeper II* NMS messages. These fields contain information that can be manipulated by Programmer Interface programs.

Procedure for Using the Programmer's Interface

The following procedure outlines the steps involved in creating applications that can be executed automatically when *StarKeeper II* NMS receives incoming messages.

Procedure 3-32. Creating a Programmer's Application

1. Identify the function of your program. Be specific. Make a list of objectives on paper, and/or a flow chart.
2. Select the type of message that will trigger your program's execution. For example, if you suspect a problem with a node, you may want to track *Report Failure* alarms from that node.
3. Determine the numeric code (*msgid*) that *uniquely identifies* the alarm message. See the node's *Messages Reference* for details. Save the *msgid* of the message as you will need the number when the Programmer's Interface is run.

4. The message format, which shows the fields contained in the alarm message, is in **Appendix H**. The fields may be accessed by your program or can be manipulated.
5. Determine what fields you need from the message you located in Step 4 of this procedure.
6. Write a program in the OS shell or C language to perform the function you selected in Step 1 of this procedure.

⇒ **NOTE:**

In a shell program, to echo any message field using **\$variable**, your program must have double quotes around the variable. For example, to echo the MSGCATEGORY field, include a line of the form:

echo "\$MSGCATEGORY"

7. Run the Programmer's Interface with the final working program using the **pi** command.

The message application procedure is illustrated in the following example.

Programmer's Interface Application Example

This example follows the steps outlined in Procedure 3-32 to execute a shell program when any alarm occurs on the node located in Philadelphia called PHILA1. The program writes one-line message summaries to a file named *pilog* in the administrator's \$HOME directory. The administrator can monitor the file's contents, or simply count the number of alarms using the OS **wc -l** utility. The program may be run for any length of time needed to determine the nature and severity of node failure problems. The resulting file should be deleted when it is no longer needed so that it does not become too large and possibly create problems on your system.

Determining the Program Function and Message Type

The function of the program is to log all alarms from the node called PHILA1, to a text file in the administrator's \$HOME directory. The program should run each time *StarKeeper II* NMS receives a *Report Failure* alarm from PHILA1 node located in Philadelphia.

Determining Message Fields

Appendix H lists message fields and definitions for each category of node and *StarKeeper II* NMS alarm and status messages.

Find the category of alarm or status message you want to monitor. The following example illustrates the format used throughout **Appendix H** to document message categories and their associated fields.

Table 3-6. Key Fields for the Programmer's Interface

Field Name	Description
MESSAGE	Contains the text of the REPORT FAILURE message.
MSGCATEGORY	The alarm severity levels are *C (critical alarm), ** (major alarm), and * (minor alarm). An AUTO A (automatic response) is issued if the message is not an alarm.
CAB	Provides the cabinet number of the entity causing the failure.
LINK	If an alarm originated on a module in a concentrator the LINK field is issued. It specifies the slot number of the trunk module that links the node and the concentrator.
SLOT1	This is the slot number of the entity causing the failure.
PORT1	This is the port number that has failed.
MESSAGE ID	This is the message ID number.
NODE_ID	The number assigned by <i>StarKeeper II</i> NMS of the node that is the source of the message.

Selecting Fields

In this example, the NODE_ID, MESSAGE ID, and MESSAGE fields of the alarms are appended to the log file created by the program. In addition, the program includes the system date in the file entry, and a blank line to separate the messages.

Writing the Program

The shell program is written and saved in a file called *PHfail.sh*. This file must be set to have executable permissions via the **chmod** command.

```
# Log message in the log file
echo "$NODE_ID Alarm $MSGID generated." >> $HOME/pilog
echo "$MESSAGE">> $HOME/pilog
echo "Received at `date`" >> $HOME/pilog
echo "" >> $HOME/pilog
```

Executing the pi Script

The **pi** command used to initiate the program request is as follows:

```
pi -nPHILA1 -r PHfail.sh.
```

Sample Program

The shell program that follows is provided for your convenience. You can modify it for your own network or create your own. In addition, the following program can be used as a template for messages and fields you select.

Capturing Alarms for Trunk Administration

The program listed below is useful for tracking trunk failures. The text of trunk failure messages is routed to the trunk administrator, whose login is *trkadmin*.

The following program sends mail to the user named *trkadmin* on trunk failures on any of the nodes that *StarKeeper II* NMS monitors. It also writes to the user's terminal if the user is logged on. The program should be entered into a file named *Trk_fail* and the file should be made executable.

```
# This program will send mail to the user trkadm and write to
# the user's terminal if (s)he is logged on to the system.
TRKADM=trkadmin          # Inform user named trkadmin on trunk failures
TMPFILE=/tmp/$TRKADM.$$  # Temporary file
# Try to determine whether the user is logged on to the system
who | fgrep $TRKADM > $TMPFILE
if [ -s $TMPFILE ]
then
    DEVF=/dev/`sed -n 1p $TMPFILE | awk '{ print $2 }'`
else
    DEVF=/dev/null
fi
DATE=`date`
# Formulate the message
cat <<! > $TMPFILE
*****TRUNK FAILURE in SLOT $SLOT1 on NODE $NODE_ID*****
Trunk failure message received by StarKeeper II NMS at $DATE
Message id.: $MSGID
Message category: "$MSGCATEGORY"
Error code: "$ERR_CODE"
Message text:
$MESSAGE
!
echo "" > $DEVF          # Send the bell character to the user's screen
cat $TMPFILE > $DEVF     # Write the message to the user's screen
mail $TRKADM < $TMPFILE  # Send the mail
rm $TMPFILE              # Remove the temp. file
```

The **pi** command used to initiate the program request is as follows:

pi -nPHILA1 -r PHfail.sh.

The **pi** command option **-r** initiates the Programmer's Interface request. Alternatively, this option could specify a shell command like *cat* or *echo*. That is, instead of executing the *Trk_fail* shell program to write to the user's terminal and send mail, the **cat** command writes the message directly to the user's terminal as long as the user is logged in. The **-n "*"** option on the command line means match all nodes. This option means that the selected message coming in from any node causes the execution of the program. The **-m** option (not shown) and message identifier *8328* is located by referring to the node's reference manuals.

The *StarKeeper* II Network Management System (NMS) uses INFORMIX as its database management system. INFORMIX provides an administrator with considerable flexibility in accessing information stored within the *StarKeeper* II NMS databases. All *StarKeeper* II NMS data on network configuration, alarms, performance measurements, and billing are contained in tables within INFORMIX databases; therefore, all the data collected by the *StarKeeper* II NMS are available to the network administrator. Some of the data can be accessed in report form using the *StarKeeper* II NMS **report** command. Other data items can be accessed by other *StarKeeper* II NMS commands, such as **cf**, **cfbdt**, or **alarm_ui** (or options of SKsh). The administrator can also customize the database tables or output reports using the interfaces to INFORMIX, as described in detail in the section titled **Producing Custom Reports** in **Chapter 6**.

The following figure shows a block diagram of the INFORMIX relational database management system. The DBMS has five interfaces to the Data Manager that access the database tables.

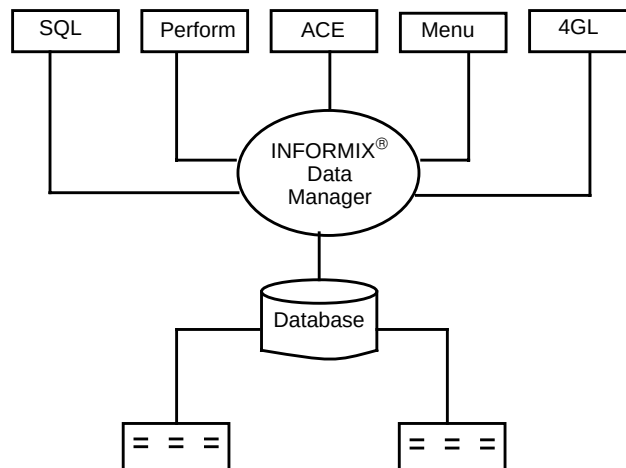


Figure 4-1. The INFORMIX Database Management System

Database Tables

The administrator enters data into database tables that are used to control the overall network. *StarKeeper II* NMS provides the means to populate databases and keep them current during real-time network operations. The database tables reside as files in the following directories:

<i>\$CNMS_DBS/cfg</i>	for configuration data
<i>\$CNMS_DBS/ahp</i>	for alarm data
<i>\$CNMS_DBS/per</i>	for performance data
<i>\$CNMS_DBS/per2</i>	for performance data
<i>\$CNMS_DBS/bill</i>	for billing data

Due to the large number of performance tables, they are kept in two separate directories: *per* and *per2*. The format (database schema) of each table is described in the section titled **Producing Custom Reports** of **Chapter 6** and the database tables are briefly discussed in the following sections.

Configuration Tables

The configuration tables define the network to the *StarKeeper II* NMS. The tables contain the configuration information on equipment entities (such as nodes, other NMSs, trunks, and concentrators) and logical resources (such as group name and service address) in the network. The Billing Day/Year Tables are also stored in this portion of the database.

The adding, changing, deleting, and verifying of configuration tables is covered later in this chapter, in the section titled **Building the Network Configuration Database**.

Alarm Tables

Alarm tables record network alarm information. Network alarm information includes the occurrence, location, status, and severity of each alarm in the *StarKeeper II* NMS network.

The adding, changing, deleting, and verifying of alarm conditioning parameters is covered in **Chapter 5**, in the section titled **Alarms**.

Performance Tables

Performance tables store various types of performance measurements data. The performance tables reside in two subdirectories. Refer to **Chapter 6** for full coverage of the performance reports.

Billing Tables

Billing tables store the billing data generated by network elements. Refer to **Chapter 6** for full coverage of the billing reports.

Backing Up and Restoring Database Tables

The administrator should back up the database tables after installation and after making changes to the data. This backup copy will reside on a tape that you keep in a safe place so that you can restore the tables if they get corrupted. Procedures for backing up and restoring the database (in whole or separately) are provided in **Chapter 7**, in the section titled **Backup and Recovery of Your *StarKeeper II* NMS System Data Files**.



NOTE:

If ICI configuration data is maintained, backing up the database is critical and should be done after ICI data is updated. Backups are necessary because *StarKeeper II* NMS contains the master copy of the ICI configuration data and the information cannot be retrieved from the node's database like other configuration data.

Initializing the Database

Before the database can be built, it must be initialized. This task is done during installation and should not be repeated, unless necessary (for example, if the database is corrupted.) Also, on a node without any database, you must recreate enough of the database so that *StarKeeper II* NMS can establish a connection to the node. Reinitializing the database, using the INITDB choice on the dbutils menu, erases all collected data. See **Chapter 7** for instructions.

Building the Network Configuration Database

Network configuration is the arrangement of equipment and services in a data-switching network. With *StarKeeper II* NMS you can add network elements into the database, delete elements, change data, and view (verify) existing network element data. The following subsections discuss how to complete these tasks and how to configure and update the database tables. You must be logged in as *cnmsadm* to run configuration commands.

***StarKeeper II* NMS Database Configuration Methods**

Whenever equipment or services are added, changed, or deleted, the data must become part of the corresponding database tables. The major entry is when *StarKeeper II* NMS is first installed. Also, there may be times when you make changes to existing network element connections and perhaps add or delete a node or other equipment; we recommend you verify and backup configuration data before making changes.

The available methods for configuring and updating the *StarKeeper II* NMS database are introduced in the following table.

Table 4-1. StarKeeper II NMS Configuration Methods

Method	Description
automated	Using the skload command, you can retrieve database configuration data of a network node and automatically enter the data in your <i>StarKeeper II</i> NMS database. Complete instructions are in the subsection titled Automated Entry and Synchronization of Node Data, in this chapter. At certain times you must run the sk_sync command to synchronize configuration database tables between <i>StarKeeper II</i> NMS and the performance connection that have the other <i>StarKeeper II</i> NMSs active console connections. Complete instructions are in the subsection titled Synchronization of StarKeeper II NMS Machines, in this chapter.
forms	Using the SKsh menu system, choose CFCOMMAN at the Main Menu and enter, change, delete, or verify network data in the <i>StarKeeper II</i> NMS database by populating the fields of forms (records) on your screen, one at a time. Forms entry is for system elements and nodes (including connection information), trunks, and concentrators. See the subsection titled Using Configuration Forms , in this chapter.
one-line	Using cfenter , cfchange , cfdelete , and cfverify commands (with required options) at the SK prompt, you can enter, change, delete, or verify network data in the database using one line of data entry for each record. One-line entry is for nodes (and other network elements), trunks, and concentrators. An example is shown in the subsection titled Using the One-Line Entry Method . Run help for full coverage of the entries for cfenter , cfchange , cfdelete , and cfverify .
DK Admin	Bridge modules are configured at the applicable network nodes by the network administrator, using data that you supply. To help gather that data, <i>StarKeeper II</i> NMS provides a bridge_aid command. Refer to the paragraph titled Configuring Bridges later in this chapter.
Network Builder	The Network Builder application is included with the Graphics System. It can be used to enter data, in one operation, into the node or <i>StarKeeper II</i> NMS database via a graphics form's interface. Refer to the <i>StarKeeper II NMS Graphics System Guide</i> or call your account representative for details.

**CAUTION:**

The methods of accessing the database discussed in Table 4-1 are the only approved methods. Do not use INFORMIX-SQL® commands to modify the *StarKeeper II* NMS database. There are internal interdependencies among various fields in the tables that cannot be reflected when a field is changed with INFORMIX-SQL. You will corrupt the database and may not be able to salvage the data if you modify the database using INFORMIX-SQL commands. You can use INFORMIX-SQL to retrieve and view stored data at any time.

**CAUTION:**

Do not run form or one-line **cf** commands while an **skload** or **cfg_sync** command is running on the same node.

⇒ NOTE:

When entering data in a database, do not use special characters to name network elements or NMS addresses. Only use alphanumeric characters; that is, uppercase letters, lowercase letters, and digits.

It is important to keep *StarKeeper II* NMS database in synchronization with the database at each node. To help ensure that this is the case, we recommend you put **cfg_sync** in a **cron** to run the command each night during off hours.

***StarKeeper II* NMS**

Database Configuration Commands

Table 4-2 briefly describes the *StarKeeper II* NMS database load and synchronization commands. Some of the commands must be run after you have added or updated the configurations of any *StarKeeper II* NMS connections or network elements. These commands ensure that *StarKeeper II* NMS knows about your network changes and keeps the *StarKeeper II* NMS database synchronized with the node database. Run **help** for a detailed description of each command.

Table 4-2. Summary of *StarKeeper II* NMS Configuration Commands

Command	Description
cfenter cfchange cfdelete cfverify	One-line commands to enter, change, delete, or verify systems, nodes, trunks, concentrators, and so forth, in the <i>StarKeeper II</i> NMS database. One-line commands are for experienced operators.
SKsh cf Command	A menu procedure that displays forms on the screen for entering, changing, deleting or verifying systems, nodes, trunks, and concentrators in the <i>StarKeeper II</i> NMS database. This method is more user-friendly than the one-line cf commands. Help is available for each entry.
skload	Retrieves configuration data from a node for entry into the <i>StarKeeper II</i> NMS database. Options allow you to load the data or save it for later loading, using cfgload . Use skload for the initial loading of a node's configuration data to the <i>StarKeeper II</i> NMS database.
cfg_sync	Use cfg_sync for periodic synchronizing of the <i>StarKeeper II</i> NMS configuration database; this is best accomplished by putting the command in a cron .
cfgload	Loads node configuration data into the <i>StarKeeper II</i> NMS database when the load now option (-l) was not used with the skload or cfg_sync commands. Configuration data includes node, trunk, concentrator, module, group, session maintenance, and service address data. Use cfgload only after skload or cfg_sync is run.
sk_sync	Synchronizes a subset of the <i>StarKeeper II</i> NMS configuration data between <i>StarKeeper II</i> NMS machines. This command is used when the performance connection for a node is on a different <i>StarKeeper II</i> NMS than the administration/console connections. You must run sk_sync whenever a change is made to one of the following database tables: trunk_info, conc, node_mod, mux, or group_name.

Table 4-2. Summary of *StarKeeper II* NMS Configuration Commands —Continued

Command	Description
conn_sync	Queries the databases of the local machine and all connected Core Systems for connection data and synchronizes the local machine's internal connection table with this data. The conn_sync command must be run on the local machine and any connected machines whenever a connection is entered, changed or moved. Keeping this information accurate will assure proper communication between Core/Co-resident Systems and the Graphics Systems.
sni_sync	Loads SNI comment and group member data into the <i>StarKeeper II</i> NMS database. Use this command when moving a node having configured SNIs from one Core System to another. For more information, see the section on Configuring an SNI in the Configuration chapter of the <i>StarKeeper II NMS Graphics System Guide</i> .
ici_dl	Downloads a network's ICI configuration data to all BNS-2000 nodes in an ICI network. ici_dl can only be run on a <i>StarKeeper II</i> NMS Core machine that has been designated as the Primary Core . For more information, see the <i>BNS-2000 SMDS Guide</i> and the sections on Configuring an ICI Carrier , Configuring ICI Address Prefixes and Configuring an ICI Group Address in the Configuration chapter of the <i>StarKeeper II NMS Graphics System Guide</i> .
cfbdt	A configuration command that displays forms on the screen for entering, changing, deleting, or verifying a set of four tables (day, bdt, byt, bytnode) to configure Billing Day/Year Tables in the <i>StarKeeper II</i> NMS database. Help is available for each entry.
SKsh BDTMGMT	A menu procedure that displays forms on the screen for entering, changing, deleting, or verifying a set of four tables (day, bdt, byt, bytnode) to configure Billing Day/Year Tables in the <i>StarKeeper II</i> NMS database. Help is available for each entry.

Synchronization of Node Data

Node configuration data can be retrieved from network nodes and optionally loaded into the configuration database, using the *StarKeeper II* NMS **skload** command. Also, data differences between nodes and the *StarKeeper II* NMS can be collected and used to update the *StarKeeper II* NMS database, using the **cfg_sync** command. The following subsections carry complete instructions.

Use the **skload** command to populate the initial tables for the *StarKeeper II* NMS database following an installation, upgrade, or conversion of *StarKeeper II* NMS. The **skload** command should also be used when adding a node to an existing, monitored network as shown in Procedure 4-1. Use **cfg_sync** to perform updates to the *StarKeeper II* NMS database tables whenever a change is made to the database at the node. The operation of the two commands is similar. See Figure 4-2 for a conceptual view.

⇒ NOTE:

As a prerequisite to running **skload**, you must first enter the node configuration information and be actively monitoring the console and administration connections. In addition, all trunk and concentrator (name, type, and backplane slot) data must be configured into the *StarKeeper II* NMS database. Refer to Procedure 4-4; use Screen 4-7 for trunks, and Screen 4-8 for concentrators.

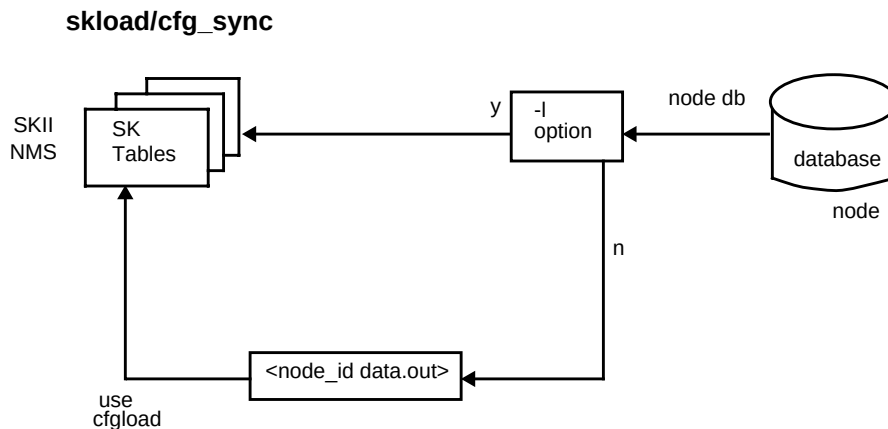


Figure 4-2. A Conceptual View of skload and cfg_sync

Prompted Entry Method

To retrieve the configuration data from a network node and load it into the *StarKeeper II* NMS configuration database, follow the steps in Procedure 4-1, or use the one-line method explained in the following subsection. Refer to the **skload** entry in the **help** command for complete coverage including a listing of the possible system responses and error messages.

**CAUTION:**

*Do not run **skload/cfg_sync** while you are using Network Builder to configure data.*

Procedure 4-1. How to Load Configuration Data from a Network Node

1. At the SK prompt, enter **skload**.
2. You are prompted for the NODE and instructed to enter a comma-separated list of node names (without spaces between the names) or a single node name or **all**.
Enter the node name(s).

3. You are asked if you want to load the database when the data is collected.
Enter **y** or **n** accordingly. If you choose **n**, the command still gathers the configuration data and you can load the database at a later time. Refer to the subsection titled **Delayed Loading of Node Databases** for complete instructions.
4. You are asked if the program should run in the background.
We recommend you enter **y** so that the program runs in the background, allowing you to do other tasks as **skload** runs. Enter **y** or **n** accordingly.
5. You are asked if the program should run in verbose mode.
We recommend you enter **y** so that the program sends messages on intermediate steps describing the progress of the command. If you choose **n**, you will not be informed of the intermediate steps. Enter **y** or **n** accordingly.
6. You are asked for a name of the file that is to receive the error and verbose messages.
Enter a file name. It cannot have a name of **skload.out** or **<node_id> data.out** and should not have the same name as an existing file name (to avoid overwriting files).
7. The command starts its function. It has a lot to do and it takes a while to complete. To check on the progress of the **skload** command (assuming you have chosen to run the command in the background) check the verbose and error messages in the output file (the name that was chosen in Step 6) by using the OS **cat** command. Enter **cat <outputfilename>**.
8. After the command completes, check the messages in the output file (specified in Step 6) for trunks or concentrators that must be entered manually (using one-line **cf** commands or forms). The names of the trunks and concentrators must be supplied by the *StarKeeper II* NMS administrator.

One-line Command Method

To run **skload** as a one-line command, use the following format.

```
skload -n <nodename> -l <y/n> [-v] [-b] [-f <outputfilename>]
```

An abbreviated list of arguments and options for **skload** are described below, followed by an example entry. The command takes a while to complete; for instructions on checking the progress of the command, refer to Step 7 in Procedure 4-1. Run **help** for complete coverage of the **skload** command entry.

Table 4-3. skload Command Options

Option	Description
-n <nodename>	A comma-separated list of node names you are accessing, or all . Do not use spaces between the node names and commas. If SMDS customers run skload with the all option, information associated with an inactive node may be deleted. To avoid this problem, SMDS customers should not run skload -n all right after an upgrade; rather, they should run it on a node by node basis or several nodes at a time.
-l <y/n>	A required entry to specify if you want to load the data in the database or merely access it and save it for later loading. If you choose n , you can load the database at a later time. Refer to the subsection titled Delayed Loading of Node Databases for complete instructions.
[-v]	An optional entry to specify if you want to use the verbose mode to inform you of intermediate actions or not. We recommend you use this option.
[-b]	An optional entry to specify that you want the command to run in the background; otherwise the command runs in the foreground. We recommend you use this option.
[-f <outputfile>]	An optional entry to specify the name of the file that is to collect error and verbose messages. It is always a good idea to collect messages, <i>especially</i> if you specify the -b option. Do not use skload.out or <node_id data.out> as the output file name.

An example one-line entry is:

```
skload -n silver,gold -l y -v -f loading
```

In the above example, the **skload** command is getting database configuration data from nodes named **silver** and **gold**, and loading the data into the *StarKeeper II* NMS database; verbose mode is specified, so messages reporting intermediate steps will be displayed on the screen (because the background **-b** option is not specified) and collected in an output file named **loading**.

If *StarKeeper II* NMS is monitoring the node console connection and if an alarm relay unit (ARU) is configured on the node, the console connections will automatically disconnect and reconnect when the administrator uses the **skload** command to load data on the node.

Delayed Loading of Node Databases

If you chose **no** for the **-l** option to **skload**, you have chosen to load the data at a time that is more convenient. When you are ready, load databases from BNS-2000 or BNS-2000 VCS nodes using the **cfgload** command. Enter **cfgload** and use the **-v** option if you want to receive verbose messages. Run help for more details on the **cfgload** command.

Once **skload** has been run for each node, it is important to keep the *StarKeeper II* NMS database in synchronization with the node database. To help ensure that this is the case, we recommend you put **cfg_sync** in a **cron** to run the command each night during off hours.

Synchronizing Network Elements and *StarKeeper II* NMS Databases

Node configuration data can be retrieved from the network and compared to the tables in the *StarKeeper II* NMS databases using the **cfg_sync** command. Differences (additions and deletions) can be optionally loaded (now or later) into the configuration database. The operation of **cfg_sync** is similar to **skload**; see Figure 4-2 for a conceptual view.

The **cfg_sync** command synchronizes data in the *StarKeeper II* NMS database with the database on the nodes that *StarKeeper II* NMS monitors. It is very important to run this command whenever changes to the node database have been made to node, trunk, service address, module, or group information at the node console or on *StarKeeper II* NMS via cut-through to the node. The applications packages rely on the Core *StarKeeper II* NMS being up-to-date.

To synchronize the database from a node, follow the steps in Procedure 4-2, or use the one-line method explained in the following subsection. If you run **cfg_sync** (either prompted-entry or one-line) in the background, the command continues to run even if you log off.

If *StarKeeper II* NMS is monitoring the node's console connection and if an alarm relay unit (ARU) is configured on the node, the console connections will automatically disconnect and reconnect when the administrator uses the **cfg_sync** command to load data on the node.

The **cfg_sync** command populates certain table information based on ICI information. When **cfg_sync** is executed on a non-primary core machine that is configured in a multicore ICI environment, the core should be connected to the primary core and the primary core should be up and running.

Procedure 4-2. How to Synchronize a Database with a Network Node

1. At the SK: prompt, enter **cfg_sync**.
2. You are prompted for a list of nodes from which you will retrieve data. This data will be used to synchronize the *StarKeeper II* NMS database for these nodes.

Enter a comma-separated list of node names (without spaces between the names), or a single name, or **all**.
3. You are asked if you want to do the database synchronization changes automatically after collecting the data.

Enter **y** or **n**. If you choose **n**, you can synchronize the database later using the **cfgload** command (whichever command is applicable for your node type). Refer to the section titled **Delayed Synchronizing of Node Databases**, which follows.
4. You are asked if the program should run in the background.
We recommend you enter **y** if you specified **all** in Step 2 so you can do other tasks while **cfg_sync** runs. Otherwise, enter **n** so that the program runs in the foreground, and you can view the progress of the command.
Enter **y** or **n**. You are asked if the program should run in verbose mode.
We recommend you enter **y** so that the program displays information on intermediate steps describing the progress of the command. If you choose **n**, you will not be informed of the intermediate steps. Enter **y** or **n**.
5. You are asked for a name of the file that is to receive the error and verbose messages.

Enter a file name, or just press if you do not want one. We recommend you do choose a file name; however, it cannot have a name of *sync.add* or *sync.del* or *<node_id data.out>* and should not have the same name as an existing file name (to avoid overwriting files).
6. To check on the progress of **cfg_sync**, if you decided to run it in the background, use the OS **tail -f** command on the files as described in Step 7 of Procedure 4-1.

Synchronizing Databases (One-line Command)

To run **cfg_sync** as a one-line command, use the following format.

cfg_sync -n <nodename> -l <y/n> [-v] [-b] [-f <outputfile>]

An abbreviated list of arguments and options are described below, followed by an example entry. The **-l** and **-n** options are mandatory. Run **help** for complete coverage of the **cfg_sync** command entry.

Table 4-4. cfg_sync Command Options

Option	Description
-n <nodename>	A comma-separated list of node names you are accessing, or all . Do not use spaces between the node names and commas. If SMDS customers run cfg_sync with the all option, information associated with an inactive node may be deleted. To avoid this problem, SMDS customers should not run cfg_sync -n all right after an upgrade; rather, they should run it on a node by node basis or several nodes at a time.
-l <y/n>	A required entry to specify if you want to synchronize the data with the collected database automatically or not. If you choose n , you can synchronize the database later using cfgload . Refer to the subsection titled Delayed Synchronizing of Node Databases for complete instructions.
[-v]	An optional entry to specify if you want to use the verbose mode to inform you of intermediate actions or not. We recommend you choose this option.
[-b]	An optional entry to specify that you want the command to run in the background; otherwise the command runs in the foreground. We recommend you choose this option.
[-f <outputfile>]	An optional entry to specify the name of the file that is to collect error and verbose messages. It is always a good idea to collect messages, especially if you specify the -b option. Do not use <i>sync.add</i> or <i>sync.del</i> or <i><node_id data.out></i> as the file name.

An example one-line entry is:

cfg_sync -n silver,gold -l y -f synchro

In the above example, **cfg_sync** gets database configuration data from local nodes named silver and gold and automatically loads the collected data into the *StarKeeper II* NMS database. Messages will be displayed on the screen because the background (**-b**) option is not specified and collected in an output file named *synchro*.

Scheduled Synchronizing of Node Databases

If you chose **no** for the **-l** option to **cfg_sync**, you have chosen to synchronize the data at a more convenient time. When you are ready, synchronize databases from the nodes, using the **cfgload** command. Enter **cfgload** and use the **-v** option if you want to receive verbose messages. Run **help** for more details on the **cfgload** command.

Automated (Nightly) Synchronizing of Node Databases

It is important to keep the *StarKeeper II* NMS database in synchronization with the database at each node. To help ensure that this is the case, we recommend you put **cfg_sync** in a **cron** to run the command each night during off hours. (Refer to the **cron** entry in the *OS System Administrator Reference Manual* for instructions on how to manually set up the crons). The **cfg_sync** entry belongs to the *cnmsadm* cron file; shown below is a sample line that would run the **cfg_sync** command every day at 4:00 a.m.

```
0 4 * * * CNMS_ROOT= /usr2/SK/r10.0 /usr2/SK/r10.0/bin/daemon/Cnmsenv
cfg_sync -n <nodename> -b -l y -v -f /tmp/cfg_sync.$$
```

Synchronization of StarKeeper II NMS Machines

For networks using the distributed processing feature of multiple *StarKeeper II* NMS Core Systems, it is important to keep configuration data synchronized between Core System machines. This synchronization is necessary when the network is partitioned functionally and the node performance and administration/console connections are not monitored by the same *StarKeeper II* NMS.

The **sk_sync** command is used to synchronize part of the *StarKeeper II* NMS INFORMIX database between two Core Systems. You will want to sync this database information so you can run performance reports that need access to configuration information. Synchronization can be performed each night by using the OS cron utility, or on-demand using the *StarKeeper II* NMS **sk_sync** command. Before running **sk_sync**, confirm that the administration/console connections have been entered on the remote *StarKeeper II* NMS with a *StarKeeper II* NMS name of the remote machine, and the **skload** command has been run on the remote machine. Note that only configuration data for the nodes with performance connections will be transferred to the local *StarKeeper II* NMS. Prior to running **sk_sync**, the two Core Systems must first be connected together via a *StarKeeper II* NMS connection. Run **sk_sync** on the machine that has the active performance connection any time you modify trunk or concentrator configuration information. In addition, you should run **sk_sync** whenever you run **cfg_sync** to update group names and module slot information.

If errors are encountered when running the **sk_sync** command, the system displays the error messages and continues with the synchronization. You then have the option of updating the table where an error was encountered by using the **sk_sync** command with the **-t** option to specify the table name. If the **-t** option is not specified, **all** configuration tables listed below will be synchronized. Another option is **-v** to receive verbose messages regarding the progress of the command. The format for **sk_sync** is: **sk_sync [-t <tablename>] [-v]**. The following tables are updated (synchronized) using **sk_sync**. The listing shows the table name and the configuration operation that causes changes to each table. If you run any of these **cf** commands, you must run **sk_sync** to synchronize configuration data. (Run **help** for detailed coverage of the options to one-line **cf** commands.)

trunk_info	cf commands on the <i>trunk</i> form
conc	cf commands on the <i>concentrator</i> form

Synchronizing Node/Connection Data

Whenever node connection data is changed, the data must be synchronized between the network-wide node connection data and the configuration databases. The Graphics System applications communicate with each other by accessing local network wide node connection data. This information is based on the configuration databases of connected *StarKeeper II* NMSs. Therefore, to maintain consistency between the local network wide node connection data and configuration databases, you must run the **conn_sync** command.

The **conn_sync** command queries the databases of the local machine and all connected Core Systems for connection information and synchronizes the local machine's internal connection table with this data. This command must be run on the local machine and any connected machines any time a connection is entered, changed, or moved. It is important that **conn_sync** is run on *all* Core Systems and inter-connected Graphics Systems whenever there is a change to connection information data, since this command only synchronizes the connection data on the machine where the command was invoked. This is necessary in order to create a consistent view of the *StarKeeper II* NMS/node network on all *StarKeeper II* NMS Core, Co-resident and Graphics Systems. The **conn_sync** command must also be run in a similar fashion when new nodes or *StarKeeper II* NMS machines are added via **cf** or Network Builder and when upgrading a node release. Keeping this information accurate will assure proper communication between all of your *StarKeeper II* NMS host machines.

You must be logged on as *cnmsadm* to run **conn_sync**.



CAUTION:

Failure to synchronize the data will result in a failure of communications between the Core Systems and the Graphics Systems.

After adding or changing any node connection data, run the **conn_sync** command by entering **conn_sync**.

System messages will keep you informed of the progress of the command. Run the **help** command for complete coverage of the **conn_sync** command including a list of system responses.

As an example scenario, there are two Core *StarKeeper* II NMSs, **star1** and **star2**, connected to each other via the network. A *StarKeeper* II NMS workstation, **ws1**, also is connected to both of the Core *StarKeeper* II NMSs, **star1** and **star2**. **Star1** has the Console and Administration connections to a node, **node1**, configured. If ownership of the Console and Administration connections to **node1** is moved from **star1** to **star2**, then the **conn_sync** command must be run on **star1**, **star2**, and **ws1**. This synchronizes the connection data residing on each of the three machines and allows applications on these machines to take the proper path when accessing the Console or Administration connections to **node1**.

Moving Nodes Between Core Systems

This section describes how to move *StarKeeper* II NMS connections to a node from one *StarKeeper* II NMS Core System to another. We assume all connections to the node (for example, console, billing, and or iep connections) are currently on the same Core System.

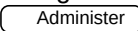
In this example, the primary Core System is named "core1", and the new Core System to which the connections will be moved is named "core2".

1. Configure the node and its connections on the new Core System "core2" (if not yet configured). If the connections are already configured go to step 2.
 - a. If using Network Builder, load the existing connection information for that node on *StarKeeper* II NMS "core1". This can be done by selecting **Configure/NMS Connections/Load**. Then choose **Configure NMS Connections - New**, and change the *StarKeeper* II NMS name to "core2". Select the option "Current Data" and then click . This will bring up the node and its connection information for the new Core System. Modify the connection information so that the status of each is inactive and the *StarKeeper* II NMS name is "core1". Submit the update for immediate execution.
 - b. For users without Network Builder, use the **cfenter** command on "core2" to enter the node and its connections; set the status of each connection as "inactive" with the *StarKeeper* II NMS name to that of the active Core System, "core1".
2. Inactivate the node connections on "core1".

- a. If using Network Builder, load the nodes connection information for "core1", and change the status of each connection to "inactive". Change the *StarKeeper* II NMS name for each connection to point to the new Core System "core2".
 - b. For users without Network Builder, use the **cfchange** command on "core1" to inactivate the connections for the node, and change the *StarKeeper* II NMS name for each connection to "core2". If you plan to never again have "core1" connected to the node, use the **cfdelete** command to delete the node.
3. Activate the node connections on "core2".
 - a. If using Network Builder, load the node connection information for "core2", and change the status of each connection to "active". Change the *StarKeeper* II NMS name for each connection to "core2".
 - b. For those users without Network Builder, use the **cfchange** command on "core2" to activate the connections for the node, and change the *StarKeeper* II NMS name for each connection to "core2".
4. Use the **connections** command on "core2" to verify that all connections are active, and then run **skload** to acquire node data.
5. If necessary, enter any trunk and/or concentrator information on "core2" as instructed by the output of **skload**. This can be accomplished by executing the **cfenter** command on "core2".
6. Synchronize the connection information.
 - a. Run **conn_sync** on both "core1" and "core2".
 - b. On any Graphics Systems connected to either "core1" or "core2", run the **Synchronize** command via the **Workstation Administration/SKII Connections Administration** menu. This can also be done via the *conn_sync* command.
7. If this node is an SMDS node, you will need to synchronize the *StarKeeper* II NMS-only SNI data between "core1" and "core2". Do this by running the command **sni_sync** on "core2" as follows.

sni_sync -n "all" -c core1

There must be a *StarKeeper* II NMS connection established between the two Core Systems. This can be administered by using **cfenter** on "core2" with the dialstring associated with to "core1".
8. Synchronizing Performance Reporter.

On each Graphics System running Performance Reporter, you will need to synchronize the configuration information by running the **Update Configuration Data** process found under the  button.
9. Synchronizing Network Monitor.

On each workstation connected to "core2", you will need to stop the Network Monitor process and restart it. Bring up the map editor and edit all references to the moved node to show the network address as "core2". These will be the *StarKeeper* II NMS name associated with the actual node, trunk and concentrators. Generate new shelf maps for this node. After that you can bring up the Network Status Display. You will also need to edit any references to that node in the scratch pad or User Defined Notices.

Using Configuration Forms

You can enter configuration data using the forms interface, which provides an easy-to-use interface to the database. Different forms are used for different pieces of equipment: node (or system), trunk, and concentrator. However, once chosen, the form does not change for the specified operation (add, delete, change, or verify).

NOTE:

The first time you use configuration commands, you will undoubtedly need to use the form entry method as supported in detail in the Procedures provided in this section. After awhile, you can skip the details of the Procedures and use the form entry method as summarized in **Table 4-5, Summary of Configuration Operations**. (The table can be used as a "crib sheet.") Later, as you become proficient with configuration operations, you may wish to use the one-line method to enter the commands.

To bring the proper form to your screen, you must make the proper choices at the Main Menu and subsequent Configuration Ring Menus. If necessary, refer to the on-line for instructions on making choices and issuing commands while at these menus. The same section also has instructions on how to retrieve data and enter data in fields on database forms (records). The fields are described as *required*, *optional*, or *display*: required fields are mandatory; if data is not provided you will not be permitted to enter the record. Optional entries allow you to enter useful information. Display fields show information based on previous field entries (no input is requested). **Chapter 2, Figure 2-1, The Menu Hierarchy**, will help you navigate the menu system.

CAUTION:

Do not run any **cf** commands while an **skload** or **cfg_sync** command is running on the same node.

⇒ NOTE:

As a brief review: while at ring menus, use the space bar to move the highlight bar to the right and use the `(BACKSPACE)` to move the bar to the left; or, use the arrow keys appropriately; or choose the first letter of any choice. When the highlight bar is where you want it, press `(Enter)`. Also, remember you can use wild cards (the * symbol) to retrieve records for changing, deleting, and verifying database records.

Procedure 4-3 presents the first steps for all configuration operations (add, change, delete, and verify) using the form entry method. After completing Procedure 4-3, continue with the appropriate configuration procedure as instructed.

Procedure 4-3. How to Enter cf Commands Using the Form Entry Method

1. From the SK: prompt, enter **cf** (or enter **SKsh** and choose CFCOMMAN from the main menu).
2. The Network Elements ring menu appears, which looks like this:

```
NETWORK ELEMENTS: System/Node  Trunk  Concentrator  Help
** one line description message appears here **
```

Screen 4-1. The Network Elements Ring Menu

3. Choose System/Node, Trunk, Concentrator or Help.
4. The Operations ring menu (see below) appears and sits on top of the chosen form. (This example shows the Node choice.) See Screen 4-3 for a node and connections form, Screen 4-7 for a trunk form, and Screen 4-8 for a concentrator form.

```
CONFIGURE A SYSTEM/NODE:  Add  Change  Delete  Verify  Help
** one line description message appears here **
```

Screen 4-2. The Operations Ring Menu

5. Choose Add, Change, Delete, or Verify (or Help). When one of the four operational choices is made, the program displays a form to input data (the enter operation) or identify records to be changed, deleted, or verified. Follow the instructions that appear on the message line and the one-line help message that appears underneath the form.

There are three types of configuration records accessible from the SKsh menu system (System/node, trunk, and concentrator), and four operations that can be done on any type of record (add, change, delete, and verify). To add a record, you specify the type of record and then fill in the requested data in the fields of a new form. The data is added to the database when you press **Ctrl g**. To change, delete, or verify a record, you enter search criteria in any or all of the fields to identify a collection of records that you will be able to look at (verify), or look at and choose the one or ones that you want to change or delete. When entering the component address (shown later in this section), you may use wild cards; if you do, the component address cannot exceed 30 characters. Start the search for the specified record by pressing **Ctrl g** and perform the desired operation (change, delete, or verify) after the records are retrieved from the database. For change or delete, you can only operate on a single record at a time. Since your search criteria may have retrieved more than one record matching the search criteria, you will have to find the record that you want to change or delete by navigating through the set of records.

**CAUTION:**

Before attempting to change the name of a System/node, concentrator, or trunk make sure all alarms for the entity being changed have been cleared.

The tables below refer you to the proper form (Screen #) and Procedure for your chosen operation. For example, if you choose to *Change a Trunk*, the tables specify Screen 4-7 and Procedure 4-5. Procedures apply to all elements.

Entry Form		Configuration Operation	
Element	Screen	Operation	Procedure
System/Node	4-3	Add	4-4
Trunk	4-7	Change	4-5
Concentrator	4-8	Delete	4-6
		Verify	4-7

**NOTE:**

The node name is used in several areas of StarKeeper II NMS processing. If the node name is changed, it must also be changed for the appropriate trunks, using the cf Trunk form. The node name must also be changed for the appropriate concentrators, using the cf Concentrator form. Finally, the node name must be changed in the network address for alarms in the Network Monitor application maps, using the map editor.

The System/Node and Connections Form

If you chose to add, change, delete, or verify a *System*, or *Node*, the following form appears.

System/Node name []			
(See note below)			
Type []	Release []		
MRCM? []	Redundant CC? []	Small window? []	
	Redundant switch? []	Enhanced switch? []	
Location []		Time zone []	
Comment []			

CONNECTION	Console [][]	Billing [][]	Performance [][]
CLASSES:	Administration [][]	MRCM Maintenance [][]	Dial Backup [][]
	Alarms [][]	StarKeeper II NMS [][]	

Screen 4-3. System/Node and Connections Form

SYSTEM/NODE DATA

- **System/Node name** - The identification of the system or node. For example: ***national/west/garden/silver***. *StarKeeper II NMS* recognizes four-level addressing; be sure there are no additional slashes (/) in the network, area, exchange, or node name. Each level cannot exceed 8 characters, except the node name, which may require up to 18 characters for certain systems.
- **Type** - The type of system or node. Enter **v** for a list of valid types.
- **Release** - The software release number of the node: For example, **3.0**.
- **MRCM?** - Does the node have an MRC?: (**y** or **n**).
- **Redundant CC?** - Does the node have a redundant control computer?: (**y** or **n**).
- **Small window?** - (**y** or **n**). This field relates to the number of packets that a port sends across the backplane before it returns an acknowledgment. This option should be set to **y** for nodes in which **TY** modules are to communicate with **AIM** modules. If this option is set to **y**, **TYs** will transmit 64 envelopes at a time, if set to **n**, **TYs** will transmit 256 envelopes at a time; the size may overload **AIM** buffers and cause loss of data during transmission.
- **Redundant switch?** - Does the node have a redundant switch module?: (**y** or **n**).
- **Enhanced switch?** - Does the node have an enhanced switch module?: (**y** or **n**).
- **Location** - The location of the equipment (an optional entry), such as: **202 Lincoln Dr.**

- **Time zone** - Enter the time zone that the system/node is in: For example, **EST5EDT** means the node is in the Eastern Standard Time zone, which is 5 hours before Greenwich mean time, and Eastern Daylight Time (optional entry) will be used when appropriate. For a list of time zone formats, press **v** when you are in this field.
- **Comment** - A comment (optional entry) that may be helpful for later operations (add, change, delete, verify), such as: **running SK II**.

The space between "System/Node Name" and "Type" on the form is reserved for service address data that is displayed for change, delete, and verify operations if **skload** or **cfg_sync** were previously run. It is not present during the initial add operation. The service address data is presented in Mnemonic four-level format and in X.121 format, as shown in the following screen.

```

Local node name: [ ]
MNEMONIC ADDRESS: Network [ ] X.121/NUMERIC ADDRESS: DNIC [ ]
                   Area   [ ]                      SR   [ ]
                   Exchange [ ]                     SA   [ ]

```

Screen 4-4. Service Address Data Display

CONNECTION CLASSES

This portion of the form identifies the type of connections used for the system/node. Adding, changing, or verifying data in this portion displays a detailed form for each class of connection. (Deleting records removes the entire node and connection class entries; use the "Change" operation to delete connection class data.)

Note that two fields exist for each type of Connection Class (see bottom part of Screen 4-3). The first field states whether or not (**y** or **n**) data has been entered for this type. The second field is where the cursor resides when you navigate to this portion of the form.

Some connection classes are not applicable according to the entry in the *Type* field for the system/node. When this is the case, the field is marked with an **n** and you cannot navigate to the field (a lockout).

Refer to **Chapter 3** for a description of each connection class.

- **Console Connection** - *Starkeeper* II NMS console connections are supported by the following form, which is displayed on the screen by pressing Ctrl **t**, when adding, changing, or verifying this data.

```

Console Connection:
    Status [   ]
    Method [   ]
    Dial string [   ] Password [   ]
    <dynamic field> [   ]
    StarKeeper II NMS name [   ]

```

Screen 4-5. Connection Class Details Form

<class of> Connection

- **Status** - The activity status for the connection: **a** for active, **i** for inactive. Console connections to Systems other than BNS-2000 or BNS-2000 VCS cannot be made active; this connection must be entered so that the **console** command can be used with other network elements. You can make a connection active only if the connection is owned by the local *StarKeeper* II NMS, as defined in the *StarKeeper* II NMS **name** field.
- **Method** - The connection method: **d** (for direct), **h** (for host), or **n** (for network).
- **Dial string** - The dial string (full path name) to the console port, such as: ***national/west/garden/gold.cons.***
- **Password** - The console security password, as assigned in the node's database for Port B. There cannot be the word "delete" in the password. To delete an existing password, enter: ***delete***. It is your responsibility to keep the password current, matching the password at the network element.

⇒ NOTE:

The password field does not apply to all the other Connection Classes; it does apply to the alarms connection and the dial backup connection.

- **<dynamic field>** - A dynamic field is identified (host number) after the information is entered in the "Method" field. See the description that follows.
 - host number** The host interface fiber connection number (**0** or **1**). "Host number" is a required entry for **host** connections.

- **StarKeeper II NMS name** - The name of the *StarKeeper II* NMS owning the connection. The default selection is the name of the *StarKeeper II* NMS that you are on. If you have multiple Core machines and the system/node connection data is entered in all the databases, **each connection must be assigned the same owner across all machines**; in other words, two (or more) *StarKeeper II* NMSs cannot own the same connection. If this is not done, Performance Reporter reports will sometimes show that "no data is available" when in fact data is available.
- **Billing** - Billing connections are supported by the same details form as for Console connections. The Billing Connections Details Form is displayed on the screen by pressing **t**, when adding, changing, or verifying this information. Valid entries for **Method** are **h** (host) or **n** (network).

Add a ". m" (dot m) suffix to the dialstring for the nodes. For example, **billing.m** would be a billing dialstring. If there is more than one node in the exchange, then you should use an alias for billing.m to specify which node's billing you want. Refer to **Chapter 3** and the accompanying text for complete instructions on assigning aliases for billing connections to multiple nodes in the same exchange.
- **Performance** - Performance connections are supported by the same details form as for Console connections. The Performance Connections Details Form is displayed on the screen by pressing **t**, when adding, changing, or verifying this information. Valid entry for **Method** is **h** (host).
- **Administration** - Administration connections are supported by the same details form as for Console connections. The Administration Connections Details Form is displayed on the screen by pressing **t**, when adding, changing, or verifying this information. Valid entry for **Method** is **h** (host). Administration connections must be established between the same *StarKeeper II* NMS and the node as was done for the console connection.
- **MRCM Maintenance** - MRC Maintenance connections are supported by the same details form as for Console connections. The MRCM Maintenance Connections Details Form is displayed on the screen by pressing **t**, when adding, changing, or verifying this information. Valid entries for **Method** are **h** (host), **d** (direct), or **n** (network).

By making this connection *active*, you are actually establishing a connection to the Port B console through the M port. To establish a console session to the M port you must run the **console** command. The Port B Console connection and the port M MRC connection cannot both be active at the same time. Also, do not make the M port connection *active* when there is a console session active for the M port. The **console** command can also force a disconnect with an M port connection. Run help for more information on the **console** entry and refer to the section titled **Connections to the MRC** in **Chapter 3**.

- **Dial Backup** - The Dial Backup Connections Details form is different than the previously described forms. The form is shown in the screen below. Display the form on the screen by pressing **t**, when adding, changing, or verifying this information.

Dial Backup Connection:	Status []
Network Telephone Number []	
Network Access password []	
Dial string []	Password []
Port Groups []	
StarKeeper II NMS name []	

Screen 4-6. Connection Class Details Form for Dial Backup

- **Status** - The activity status for the connection: **a** for active, **i** for inactive.
- **Network Telephone Number** - The telephone number of the network being accessed. This is the network telephone number for modem access.
- **Network Access Password** - The password required for accessing the network from the modem connection.
- **Dial string** - The dial string (full path name) to the equipment, such as: ***national/west/garden/gold***. This is a required entry.
- **Password** - The console security password, as assigned in the node's database for Port B. There cannot be the word "delete" in the password. To delete an existing password, enter: ***delete***. It is your responsibility to keep the password current, matching the password at the node.
- **Port Group(s)** - The name of the port group used to connect to the node. This is a required entry.
- **StarKeeper II NMS name** - The name of the *StarKeeper II* NMS owning the connection. The default selection is the name of the *StarKeeper II* NMS that you are on. If you have multiple Core machines and the system/node connection data is entered in all the databases, **each connection must be assigned the same owner across all machines**; in other words, two (or more) *StarKeeper II* NMSs cannot own the same connection. If this is not done, Performance Reporter reports will sometimes show that "no data is available" when in fact data is available.

- **Alarms** - Alarm connections are supported by the same details form as for Console connections. The Alarms Connections Details Form is displayed on the screen by pressing **t**, when adding, changing, or verifying this information. Valid entries for **Method** are **h** (host), **d** (direct), or **n** (network). Supply the alarms security password, as assigned in the database for the network element. There cannot be the word "delete" in the password. To delete an existing password, enter: **delete**. It is your responsibility to keep the password current, matching the password at the node. Alarm connections are associated with the transport of alarms to and from network elements other than the nodes.
- **StarKeeper II NMS** - The *StarKeeper II* NMS Connection Class Details form is similar to the previously described forms. The **System/Node name** must be the OS name (**uname**) of the remote *StarKeeper II* NMS host. The **Method** must be host (**h**) and the *StarKeeper II* NMS Name is not requested. The **Dial string** must match the listener address on the remote *StarKeeper II* NMS. The form is used to configure *StarKeeper II* NMS to *StarKeeper II* NMS connections, and is displayed on the screen by pressing **t**, when adding, changing, or verifying this information. Valid entry for **Method** is **h** (host). This form is used only on the calling *StarKeeper II* NMS. If you encounter problems when setting up a Core to Core connection, refer to the help file for LD_SCP. Enter **help LD_SCP** and follow the recommended actions.

The Trunk Form

If you chose to add, change, delete, or verify a *Trunk*, the following form appears. At least one end of a trunk must reside on a node monitored by this *StarKeeper II* NMS. Fields for "side 1" must correspond to the "monitored" side.

```

Trunk name [          ]
Node name 1 [          ]
Module address 1 [    ] Trunk type 1 [          ]
Node name 2 [          ]
Module address 2 [    ] Trunk type 2 [          ]
Comment [          ]
For ISN nodes:
Name 1 [          ]      Name 2 [          ]

```

Screen 4-7. The Trunk Form

- **Trunk name** - The name of the trunk (a required entry and unique for each trunk); for example: **silgo**. "Trunk name" is a *StarKeeper II* NMS concept and does not appear in the node. An entry is required here before any trunk data can be loaded or synchronized with the node.
- **Node Name 1** - The name of the node at the monitored end of the trunk. For example, **silver**.
- **Module address 1** - The node module address at the "Node name 1" end of the trunk. Acceptable entries are shown on the screen (line 23).

- **Trunk type 1** - The type of trunk at the "Node name 1" end. For a list of valid entries, enter **v**.
- **Node Name 2** - The name of the node at the other end of the trunk. For example, **gold**. Note that **cf** commands allow you to leave this blank, signifying that the other side of the trunk resides on a node not monitored by this *StarKeeper II* NMS.
- **Module address 2** - The node module address at the Node 2 end of the trunk. Acceptable entries are shown on the screen (line 23). Also, a null value is allowed if a null was used for the Node Name 2 field.
- **Trunk type 2** - The type of trunk at the Node 2 end. For a list of valid entries, enter **v**. Also, a null value is allowed if a null was used for the Node Name 2 field.
- **Comment** - A comment (optional entry) that may be helpful for later changes, verification, and so forth. For example: **High speed trunk connecting silver to gold nodes**.

For ISN nodes: - Leave these fields blank.

The Concentrator Form

If you chose to add, change, delete, or verify a *Concentrator*, the following form appears. You must define all concentrators in the *StarKeeper II* NMS database before **skload** or **cfg_sync** can be run.

```

Conc name [ ]          Conc type [  ]
Conc module address    Conc module address
Primary [  ]           Alternate [  ]
                        Link type [  ]
                        Link used [  ]
Node name [           ]
Node module address    Node module address
Primary [  ]           Alternate [  ]
Location [             ]
Comment [              ]

```

Screen 4-8. The Concentrator Form

Where applicable, press **v** for a list of valid entries in a field.

- **Conc name** - The name of the concentrator. For example: **conc1**.
- **Conc type** - The type of concentrator. This must be provided, as it is a *StarKeeper II* NMS concept exclusively.
- **Conc primary module address** - The address of the primary link interface on the concentrator side.
- **Conc alternate module address** - The address of the alternate link on the concentrator side.

- **Link type** - The type of link.
- **Link used** - The link is the Primary or Alternate link.
- **Node name** - The name (address) of the node connected to the concentrator. For example: ***national/west/957/platinum***.
- **Node module primary address** - The address of the primary link interface on the node side.
- **Node module alternate address** - The address of the alternate link interface on the node side.
- **Location** - The location (optional entry) of the concentrator, for example: ***123 Main Street***.
- **Comment** - A comment (optional entry) that may be helpful for later use.

Adding Configuration Records

To add configuration records to the database, using the form entry method, you must access the proper ring menus and configuration forms (see Procedure 4-3); then follow the steps in Procedure 4-4.

If you add a system/node, you must run the **conn_sync** command to synchronize the node connection data with the configuration databases. Refer to the previous section titled **Synchronizing Node/Connection Data** in this chapter for instructions.

Observe the help messages (lines 2 and 23) on the forms as you add data; they will assist you each step of the way. Help also is available at the menu level by pressing **h** or at any level by pressing Ctrl **o**.

Procedure 4-4. How to Add (Enter) Configuration Records

1. Having chosen "add" (in Procedure 4-3), the program highlights the entry fields on the form. See the field descriptions for each form as described earlier in this section: Screen 4-3 for the System/Node form, Screen 4-7 for the Trunk form, or Screen 4-8 for the Concentrator form.
2. In some cases, the form has default values inserted as an aid. Choose the default values or enter the data you want. The cursor will start you at the top of the form. Enter data and progress through the form until you are finished.
3. When you finish entering data on the form, press Ctrl **g**. This action starts a verification process to assure all your entries are valid.
4. If you are entering data in the Trunk or Concentrator form, pressing Ctrl **g** adds the data to the configuration database (a one-line message verifies the addition). If there is a problem, you will be prompted to correct your entry. You can now skip to Step 5 of this Procedure.

However, if you are adding data to the System/Node form, pressing **Ctrl g** moves you into the CONNECTION CLASSES portion of the form at the Console field. Press **Ctrl t** to display the Connection Class Details Form (Screen 4-5). Fill in the requested data and when you are finished press **Ctrl g**. This will add the data to the database. The cursor returns to the CONNECTION CLASSES at the Console field.

If there is a billing connection to enter, press **Ctrl t** to display the Billing connection form to the screen. It is in the same format as the Connection Class Details Form (Screen 4-5). Enter data as you did for the Console connection and when you are done, press **Ctrl g** to enter the data. The cursor returns to the CONNECTION CLASSES at the Console field. If applicable, repeat the procedure for the MRC Maintenance Connection field using **Ctrl t** to display the form on the screen and **Ctrl g** to enter the data. Similarly for the other types of connection classes.

5. Once the addition to the database is made, the process returns you to the top of the form. Then you can add another network element.
6. When you wish to exit the form, press **Delete** to return to the Operations Ring Menu. There you can choose to do a different operation on the same type of equipment previously chosen on the Network Element Ring Menu.
7. When you finish with the Operations Ring Menu, press **Delete** to return to the Network Element Ring Menu. There you can choose a different piece of equipment to configure.
8. When you finish with the Network Element Ring Menu, press **Delete**. This will bring a confirmation ring menu to the screen; choose "yes" and exit to the shell.

Changing Data in the Configuration Records

To change data in the configuration records of the database using the form entry method, you must access the proper ring menus and configuration forms (see Procedure 4-3); then follow the steps in Procedure 4-5.

If you change a connection to a system/node, you must run the **conn_sync** command to synchronize the node connection data with the configuration databases. Refer to the previous section titled **Synchronizing Node/Connection Data** in this chapter for instructions.

Observe the help messages (lines 2 and 23) on the forms as you search for records and make changes; they will assist you each step of the way. Help also is available at the menu level by pressing **h** or at any level by pressing **Ctrl o**.

Procedure 4-5. How to Change Data in Configuration Records

1. Having chosen "change" (in Procedure 4-3), the program asks you to enter search criteria to identify the equipment to be changed.
2. Identify the records to be changed. You can enter data in any field in a general section. For example, for changing a node record, position the cursor on the "System/node name" field and enter ***national/west/garden/**** to specify all node records in the national/west/garden (network/area/exchange). Leave the form blank to choose all records. Whenever your search criteria could retrieve more than one specific record, you will have to navigate among the set of records to choose the record(s) you wish to change. Refer to Table 2-2 in **Chapter 2** for a list of the special navigation keys.
3. When you finish entering the search criteria, press Ctrl **g**. This action starts a search process for all records that match the search criteria.
4. The screen displays the configuration form for the first record. At the top of the record is the Change Ring Menu, which looks like this:

CHANGE: Change_this_record Next Previous Jump First Last Help

or

CHANGE: System/node connection Next Previous Jump First Last Help

Screen 4-9. The Change Ring Menu

5. Choose the record you want to display (and then change), as explained below.

⇒ NOTE:

For System/node changes, you choose if you want to change the System/node or the Connection portion of the record. See the second Change Ring Menu shown in Screen 4-9.

Change_this_record to change the currently-displayed record.

Next to display the next record on the screen.

Previous to return to view the previously-displayed record.

Jump to go directly to the record number that you specify.

First to return to the first record.

Last to display the last record on the screen.

Help screen help on the application or use of special keys.

6. When the screen displays the record you want to change, choose **Change this record** from the Change Ring Menu. If this is a System/node record, choose **System/node** or **Connection**.
7. Press to skip from field to field until you get to the field you want to change. Type the new or corrected data into the appropriate field. If you chose **Connection** press **t** to display the Connection Class details form for the selected Connection Class. If you change connection data, be sure to run the **conn_sync** command. See **Synchronizing Connection Data** for instructions.

To change the Console password, refer to the **Security** section of **Chapter 3** for complete instructions.

8. When you finish changing data on the record, press **g**. This action starts a verification process to assure all your entries are "legitimate." If they are, the data is changed in the configuration database; if not, you are prompted to correct your entry.

You are prompted to confirm your change (**y** or **n**).

⇒ NOTE:

If you change the connection flag (active to inactive or inactive to active), the data is changed in the configuration database; but, it will take approximately 40 to 50 seconds to change the actual connection (active or inactive).

By making the MRC connection *active*, you are actually establishing a connection to the Port B console through the M port. To establish a console session to the M port you must run the **console** command (see the MRC discussion in **Chapter 3** for more information). The Port B Console connection and the port M MRC connection cannot both be active at the same time. Also, do not make the M port connection *active* when there is a console session active for the M port. The **console** command can also force a disconnect with an M port connection. Run **help** for more information on **console** entry and refer to the section titled **Connections to the MRC** in **Chapter 3**.

9. When the change is entered into the database, you are returned to the Change Ring Menu. There you can choose to change another record by repeating steps 5 thru 8, above.
10. When you finish making changes to the chosen equipment press at the Change Ring Menu to return to Operations Ring Menu. There you can choose to do a different operation on the same type of equipment previously chosen on the Network Element Ring Menu.
11. When you finish with the Operations Ring Menu, press to return to the Network Element Ring Menu. There you can choose a different piece of equipment to configure.

12. When you finish with the Network Element Ring Menu, press . This will bring a confirmation ring menu to the screen; choose "yes" and exit to the shell.

Deleting Configuration Records

To delete configuration records in the database using the forms method, you must access the proper ring menus and configuration forms (see Procedure 4-3); then follow the steps in Procedure 4-6.

If you delete a system/node, you must run the **conn_sync** command to synchronize the node connection data with the configuration databases. Refer to the previous section titled **Synchronizing Node/Connection Data** in this chapter for instructions.

NOTE:

The delete operation removes all database report data for the chosen entity. Deleting a node will remove that record from the node table and conn_info table. Reports that are run for a deleted node name will not be available once the node name is deleted. Run all reports and clear all alarms before deleting a node name.

Observe the help messages (lines 2 and 23) on the forms as you search for records and make deletions; they will assist you each step of the way. Help also is available at the menu level by pressing **h** or at any level by pressing **o**.

Procedure 4-6. How to Delete Configuration Records

1. Having chosen "delete" (in Procedure 4-3), the program asks you to enter search criteria to identify the equipment to be deleted.
2. Identify the records to be deleted. You can enter data in any field in the general section. For example, position the cursor on the Node field and enter **national/west/garden/*** to specify all records for nodes in the national/west/garden (network/area/exchange). Leave the form blank to choose all records. Whenever your search criteria could retrieve more than one specific record, you will have to navigate among the set of records to choose the record(s) you wish to delete. Refer to Table 2-2 in **Chapter 2** for a list of the special navigation keys.

If a node with an MRC is being monitored via the M port, then neither the MRC M port information nor the node itself can be deleted. Also, the node cannot be deleted if an active console session exists with Port B on the node.

3. When you finish identifying the records to be deleted, enter **g**. This action starts a search process for all records that match the search criteria.

4. The process displays the configuration form for the first record, and displays the Delete Ring Menu as shown in Screen 4-10. The top screen represents an equipment choice other than "System/node," and the bottom screen represents the "System/node" choice of equipment.

DELETE: Delete_this_record Next Previous Jump First Last Help

or

DELETE: System/node Next Previous Jump First Last Help

Screen 4-10. The Delete Ring Menu

5. Choose the record you want to display (and then delete), as explained below:

For System/node deletions the associated Connection Classes data also is deleted. If you wish to delete any Connection Class data, but not the entire node/system record, use the Change Operation (Procedure 4-5, especially Step 7).

Delete_this_record	to delete the currently-displayed record.
Next	to display the next record on the screen.
Previous	to return to view the previously-displayed record.
Jump	to go directly to the record number that you specify.
First	to return to the first record.
Last	to display the last record on the screen.
Help	screen help on the application or use of special keys.

6. When the screen displays the configuration record to be deleted, choose **Delete this record** from the Delete Ring Menu. This displays a Confirm Ring Menu.
7. Choose yes (**y**) or no (**n**) to confirm your choice. You return to the Delete Ring Menu.
8. Use the Delete Ring Menu to choose the next record to be deleted. When you finish deleting the chosen equipment records, press at the Delete Ring Menu to return to the Operations Ring Menu. There you can choose to do a different operation on the same type of equipment previously chosen on the Network Element Ring Menu.
9. When you finish with the Operations Ring Menu, use the to return to the Network Element Ring Menu. There you can choose a different piece of equipment to configure.

10. When you finish with the Network Element Ring Menu, press . This action displays a Confirm Ring Menu; choose "yes" and exit to the shell.

**NOTE:**

z will exit the configuration application at any point.

Verifying Data in Configuration Records

To verify (view) configuration records in the database using the forms method, you must access the proper ring menus and configuration forms (see Procedure 4-3); then follow the steps in Procedure 4-7.

Observe the help messages (lines 2 and 23) on the forms as you search for records and verify data; the help messages will assist you each step of the way. Help also is available at the menu level by pressing **h** or at any level by pressing **o**.

Procedure 4-7. How to Verify Data in a Configuration Record

1. Having chosen "verify" (in Procedure 4-3), the program asks you to input search criteria to identify the configuration records to be verified.
 - a. To retrieve all records for verification, press **g**.
 - b. Press to position the cursor on the field(s) in which you want to enter search criteria. For example, if you wanted to verify all the nodes identified as DKII, you would move to the Type field and enter **DKII** and then start the search for all DKII type nodes by pressing **g**. Leave the form blank to choose all records for verification.
2. The process retrieves all records that correspond to the search criteria and displays the configuration form for the first record. Whenever your search criteria could retrieve more than one specific record, you will have to navigate among the set of records to choose the record(s) you wish to verify. Refer to Table 2-2 in **Chapter 2** for a list of the special navigation keys.

3. At the top of the form will be the Verify Ring Menu, which looks like this:

VERIFY: Next Previous Jump First Last Help

or

VERIFY: Next Previous Jump First Last Help

Screen 4-11. The Verify Ring Menu

4. Choose the record you want to verify, as explained below:

Connection	to verify data in the Connection Classes portion of the displayed form (for System/node verifications). Press Enter to skip from one connection class to another; display the selected details form with the Ctrl t .
Next	to display the next record on the screen.
Previous	to return to view the previously-displayed record.
Jump	to go directly to the record number that you specify.
First	to return to the first record.
Last	to display the last record on the screen.
Help	screen help on the application or use of special keys.

5. When you finish verifying the chosen equipment configuration record, press to return to the Operations Ring Menu. There you can choose to do a different operation on the same type of equipment previously chosen on the Network Element Ring Menu.
6. When you finish with the Operations Ring Menu, press to return to the Network Elements Ring Menu. There you can choose a different piece of equipment to configure.

7. When you finish with the Network Element Ring Menu, press Delete. This action displays a Confirm Ring Menu; choose "yes" and exit to the shell.

Table 4-5. Summary of Configuration Operations

Add	Change	Delete	Verify
At SK prompt enter cf	At SK prompt enter cf	At SK prompt enter cf	At SK prompt enter cf
Choose System/Node, Trunk, and so forth	Choose System/Node, Trunk, and so forth	Choose System/Node, Trunk, and so forth	Choose System/Node, Trunk, and so forth
Choose "Add"	Choose "Change"	Choose "Delete"	Choose "Verify"
Displays all default values on form	Clears the form	Clears the form	Clears the form
Enter data for added equipment	Input search criteria or leave blank to choose "all"	Input search criteria or leave blank to choose "all"	Input search criteria, or leave blank to choose "all"
When finished, press Ctrl-g	When finished, press Ctrl-g	When finished, press Ctrl-g	When finished, press Ctrl-g
If System/node, add connection info. Use Ctrl-t to call details	First record is displayed	First record is displayed	First record is displayed
When finished, press Ctrl-g	Calls CHANGE Ring Menu	Calls DELETE Ring Menu	Calls VERIFY Ring Menu
Record Validation (If OK, record is added to db)	Choose "System/node, Connection, Next, Previous, Jump, First, Last" to view forms; Ctrl-t for conn details	Choose "Delete this Record" or "System/node" to delete	Choose "Connection, Next, Previous, Jump, First, Last" to view forms; enter Ctrl-r for conn details
Add more equip., or press DEL to exit Add mode	Choose "Change This Record" to enter the form, then change data	Choose "Delete this Record" or "System/node" to delete	Verify data
	When finished, press Ctrl-g	Enter CONFIRM Ring Menu (choose y or n)	To exit the Verify mode, press DEL
	Record validation takes place	Re-calls DELETE ring menu	
	Enter CONFIRM Ring Menu (choose y or n)	Delete more equip., or press DEL to exit Delete mode	
	Change more equip., or press DEL to exit Change mode		

Using the One-line Entry Method

The configuration operations available through ring menus and form entries also are available through one-line commands. Using one-line commands, you bypass the ring menus and the forms by entering the entire operation on one line. The appropriate configuration operations are done using the **cfenter**, **cfdelete**, **cfchange**, and **cfverify** commands with the appropriate object and options. Be sure to verify all changes to ensure they took place as expected. Run **help** for full coverage of the command names. The commands can be abbreviated to: **cfe**, **cfd**, **cfc**, and **cfv**. For example:

```
cfe node -n national/west/garden/silver1 -s dkii -r 3.0 -l SK room -m n -rc n -w n -cm h -cs i -cd star1 -cp 0
```

enters a record of a **node** having an address name of **national/west/garden/silver1**, the **system** type is BNS-2000 VCS (**dkii**), running software release 3.0, the node is located in the **SK room**, the **mrcm** (MRC) is not installed, the redundant control computer is **not** installed, and the small **window** is **not** used; also, the console connection **method** is **host**, the console **status** is **inactive**, the console **dialstring** is **star1**, and the console **port** is **0**. Additional information, whether conditional or optional, such as a comment, could also be included, using the proper options.

⇒ NOTE:

When using the **cf change** command, if you change the connection flag (active to inactive or inactive to active), the data is changed in the configuration database; but, it will take approximately 40 to 50 seconds to change the actual connection (active or inactive). Use the **cfverify** command to validate changes. Use the connection command to see if the connection status change has been made. Refer to **Connection Problems** in **Chapter 7**.

⚠ CAUTION:

Be careful using wild cards (the asterisk) with one-line **cf** commands. For a one-line verify command, "*" alone means *all* records and "*" as part of a field (for example, "silver*") means records that match the criteria (for example, silver1 and silver2 and silver3). For one-line change and delete commands, "*" alone is an invalid option, and "*" as a part of a field means only the first record matching the criteria. In our example "silver*" means only silver1 for change and delete one-line commands.

Wild cards are used in verify to allow for such things as: **cfv node -N "silver*"** which matches all node names beginning with "silver." This is very useful; however, be aware of the different response when used with **cfchange** and **cfdelete**. You could use the wild card character and not change or delete records that you wanted to access. If you used "silver*" in a delete operation, for example: **cfd node -N "silver*"** would only delete silver1; silver2 and silver3 would be unaffected, and you may not know this since there are no confirmation methods.

Backing up (and Restoring) the Configuration Database

Back up the configuration database after installation and after making significant changes to the data. The backup copy is on a cartridge tape and should be kept in a safe place in the event you need to restore the configuration database.

StarKeeper II NMS has **skbackup** and **skrestore** commands to expedite these operations. The **-c** option specifies the configuration database. Procedures for backing up and restoring the configuration database (and other software) are provided in **Chapter 7**, the section titled **Backup and Recovery of Your *StarKeeper II* NMS System Data Files**.

Configuring Bridges

Bridges must be configured at the applicable network nodes by the network administrator, who will rely on you for complete information on the bridges. To help gather that data, *StarKeeper II* NMS provides the **bridge_aid** command.

Entering **bridge_aid** and its options, generates a form that requests information the network administrator needs to provision the bridges. The options for the **bridge_aid** command are:

- n** a required entry. Specify the number of modules (2-9) bridged.
- p** an optional entry. If used, the form is sent to your printer for a hard copy that you fill out and bring to the network administrator. If not used, the form is sent to your screen for viewing only.

A sample form for 2 modules is shown in Screen 4-12. It is the form sent to your screen or to the printer if you enter: **bridge_aid -n2**.

PROCEDURE FOR SETTING UP A BRIDGE

1. Identify the following information for this bridge:
 - a. Bridge name: _____
 - b. Bridge type: _____
 - c. Node address: _____
 - d. Concentrator address: _____
2. a. Identify the originating group name for this bridge: _____
 - b. At the node, use the "verify group" command to see if this name has already been entered. If not, enter this group using the "enter group" command.
3. a. Identify the receiving group name for this bridge: _____
 - b. At the node, use the "verify group" command to see if this name has already been entered. If not, enter this group using the "enter group" command.
4. a. Identify the service address for this bridge: _____
 - b. At the node, use the "verify name" command to see if this name has already been entered. If not, enter this name using the "enter name" command.
 - c. At the GROUP(S) prompt, enter the receiving group name from 3.a.
5. Identify a PDD address for each of the originating groups below. The PDD address format is: <service address>.<conc addr>/<mod addr>.<chn1>

MOD ADDR	CHNL NO	GROUP TYPE	GROUP NAME	PDD ADDRESS<ES>
1	1	recv	_____	_____
2	1	orig	_____	_____
6. At the node, enter the information from 5 using the "enter bridge" command. At the MODULE ADDRESS prompt, you must enter the <conc addr>/<mod addr>.
7. At the node, check the configuration with the "verify bridge"

Screen 4-12. Sample Bridge Setup Form for 2 Bridge Modules

Changing Concentrator Links

When damage is suspected or detected on a concentrator link, the administrator can switch the slot where the concentrator resides to a spare slot, using the *StarKeeper II* NMS **chg_link** command. Follow the steps in the procedure below to change concentrator links and run **help** for complete coverage of the **chg_link** command.



CAUTION:

Running **chg_link** takes the concentrator out of service.

Procedure 4-8. How to Change Concentrator Links

1. Enter the spare link switchover command using the format:
chg_link -n <nodename> -c <concentrator name>.
For example,
chg_link -n west/957/platinum -c conc1
2. The screen displays a warning that the concentrator will be taken out of service.
3. The screen also displays messages regarding the progress of the process (remove, change, restore).
4. The process is complete. Service is restored to the new link.

The switchover can be performed periodically to ensure the spare link is functioning.

Building the Billing Day/Year Tables Database

Using the features to be described below, you can specify billing rates to be applied to calls originated from the X.75 modules in your network. The objective is to make sure that rates for every day of the year are specified. You will be able to indicate days of the year whose rating approaches are identical, and you will also be able to highlight days of the year which you wish to handle in a special way. In addition to being able to identify how each day is to be treated, you will also be able to specify up to three rate periods per day.

To support the flexibility of billing rate treatment, you will interact with some *StarKeeper II* NMS Core System forms that will be described, below. The process of specifying how you want to handle billing for the X.75 calls involves several steps and data that is stored in several INFORMIX relational database tables. What you will be doing through these forms is constructing Billing Day Tables

(BDT) and Billing Year Tables (BYT). The BDT and BYT are related to the data stored in the database, but are at a more conceptual level than the database.

The easiest way to understand the Billing Day Table is to think of it as telling you what rate should be in effect every hour of a day. The easiest way to understand the Billing Year Table is to think of it as telling you what rate structure to use for every day of a year.

The Billing Day Table

Trying to manage twenty-four different billing rates in a single day would be a daunting task. Therefore, using a model provided by voice billing, three different hourly rates per day are supported. To allow flexibility, instead of specifying the rates themselves for each hour, a number representing the level of the rate is used for each hour when specifying the Billing Day Table. Those three different hourly rate levels, in the range 1-3, are called Billing Period Indicators (BPI). The value 3 is to be used to indicate the most expensive rate, and the value 1 indicates the least expensive rate.

This means that in a day you can apply at most three different billing rates even though the daily rates can vary from day to day.

For example, if you assume that BPI 3 can be associated with the most expensive hours of the day, you could configure your billing rate structure so that the hours of 8:00AM to 5:00PM (not inclusive) would correspond to that one rate. Further, you could consider the hours of 5:00PM to 10:00PM as less expensive, but not the least expensive time of the day, and assign that time interval a BPI value of 2. Finally, you could assign the remaining time interval (10:00PM to 8:00AM) a BPI value of 1, which is the BPI number that corresponds to the "least expensive" billing rate.

StarKeeper II NMS provides an additional level of flexibility in that you can construct as many as ten different versions of daily rate structures. In other words, in the example given above:

08:00AM to 05:00PM	BPI=3
05:00PM to 10:00PM	BPI=2
10:00PM to 08:00AM	BPI=1

could apply as one particular billing rate schedule, but another one might be more stringent for heavy business use, making morning hours more expensive than afternoon hours, as follows:

08:00AM to 12:00PM (NOON)	BPI=3
12:00PM (NOON) to 05:00PM	BPI=2
05:00PM to 08:00AM	BPI=1

The first one becomes a specific BDT type and the second one becomes a different BDT type.

To begin to show you how the BDT looks, the following example is a 24-hour translation of the first of the two tables described above. The first specification, if expanded on an hour-by-hour basis, would look like this.

Hour 0 (MIDNIGHT through 12:59AM)	BPI=1
Hour 1 (01:00AM through 01:59AM)	BPI=1
Hour 2 (02:00AM through 02:59AM)	BPI=1
Hour 3 (03:00AM through 03:59AM)	BPI=1
Hour 4 (04:00AM through 04:59AM)	BPI=1
Hour 5 (05:00AM through 05:59AM)	BPI=1
Hour 6 (06:00AM through 06:59AM)	BPI=1
Hour 7 (07:00AM through 07:59AM)	BPI=1
Hour 8 (08:00AM through 08:59AM)	BPI=3
Hour 9 (09:00AM through 09:59AM)	BPI=3
Hour 10 (10:00AM through 10:59AM)	BPI=3
Hour 11 (11:00AM through 11:59AM)	BPI=3
Hour 12 (NOON through 12:59PM)	BPI=3
Hour 13 (01:00PM through 01:59PM)	BPI=3
Hour 14 (02:00PM through 02:59PM)	BPI=3
Hour 15 (03:00PM through 03:59PM)	BPI=3
Hour 16 (04:00PM through 04:59PM)	BPI=3
Hour 17 (05:00PM through 05:59PM)	BPI=2
Hour 18 (06:00PM through 06:59PM)	BPI=2
Hour 19 (07:00PM through 07:59PM)	BPI=2
Hour 20 (08:00PM through 08:59PM)	BPI=2
Hour 21 (09:00PM through 09:59PM)	BPI=2
Hour 22 (10:00PM through 10:59PM)	BPI=1
Hour 23 (11:00PM through 11:59PM)	BPI=1

Returning to the examples, a third BDT type might be associated with weekend activity, where all twenty-four hours are treated with one BPI value, as follows:

12:00AM (MIDNIGHT) to 12:00AM (MIDNIGHT)	BPI=1

StarKeeper II NMS provides further flexibility by allowing you to treat different geographic areas with different BDT types. In other words, if you were dealing with traffic from two different states or two different countries, you could have a series of up to ten BDT types for the first state or country and a different series of up to ten BDT types for the second state or country.

Returning to our examples, above, you might apply the first and the third BDT types to activity associated with Kansas and the second and the third BDT types with Nebraska. Or you might apply two BDT types above with Spain and two others with France.

In this context, a geographic area can be a country, a region, or a state within a country where the nodes you want to monitor are located.

The Concept of Billing Year Table

From a conceptual point of view, a Billing Year Table (BYT) tells you what Billing Day Table to use during every day of the year.

Instead of storing 365 or 366 different entries to specify each and every day of the year, only as many entries are stored as are needed to reflect differences between one day and another. In other words, most weekdays are simply not holidays, so all non-holiday weekdays would only need to have one entry to reflect them all together. Weekends could be treated as one entry. General holidays could be specified appropriately.

Therefore once all the possible day categories have been identified and defined, it is sufficient to associate the day category with the corresponding BDT type to have a full specification of the way to handle billing every day of the year.

To help make it easier to categorize similar days of the year (that is, days whose billing rate schedules (BDT type) are the same), you can "tag" a collection of days of the year with a letter (for example, "w" for "weekdays"). Likewise, you will "tag" a particular BDT type with a number.

For example, if you want to associate the day type equal to "w" for all the weekdays of the year and the BDT type equal to "1", you would make an entry in the BYT that will associate "1" with "w". In the same way if you want to associate the day type equal to "h" for all the Sundays of the year and the BDT type equal to "2", you would make an entry in the BYT that will associate "2" with "h". See the detailed example of billing data configuration at the end of this section for a clarification of this association mechanism.

There are situations where you have weekdays that are considered holidays and therefore may need to be billed in a different way. For example, December 25th is a fixed holiday that can happen to be a weekday. Since December 25th is normally billed like a Sunday or a general holiday, you have to be able to specify that this individual, special weekday will be treated like a holiday. Days like this are treated as special cases in the sense that a special entry will be made in the BYT. In this case, you would enter 1225 in the BYT (December 25th) with a day type equal to "w" (weekday) but with a BDT type "tag" equal, for example, to the one that you might have associated with a Sunday (day type "h").

Another example of a special day (holiday) is Labor Day in the USA. The date of this holiday changes from year to year, but it is always the first Monday in September. Thanksgiving in the USA is another example of a holiday whose date changes from year to year. This illustrates the need to be able to generate BYT data on a per-year basis. In order to handle this situation, BYT information for at least the current and the following year would have to be specified, so that when the year changes, *StarKeeper II* NMS will have the appropriate BYT information for the new year. There are no restrictions on the number of BYTs that can be configured. In principle a *StarKeeper II* NMS administrator could configure the BYTs for several years at once.

For both the BDT and the BYT, the geographic flexibility described above has been provided to accommodate some European customs, where the holidays of one country or one area inside a country, might differ from those in another area within the same country or from those in another country. Within the USA, it is also possible that one state will celebrate a local holiday that a neighboring state might not celebrate at all or might celebrate on another date. If such variations implied that billing rates should be adjusted, you could use this feature to capture that requirement.

Each different BYT configured for the same year is said to represent a "BYT area" and is identified by a BYT area indicator. For each country at least one BYT has to be configured for each year, but the same BYT can be associated with a different area if the two areas have the same holidays and billing rates.

A simple graphical representation of the two concepts of Billing Day/Year Tables is depicted in the following figures.

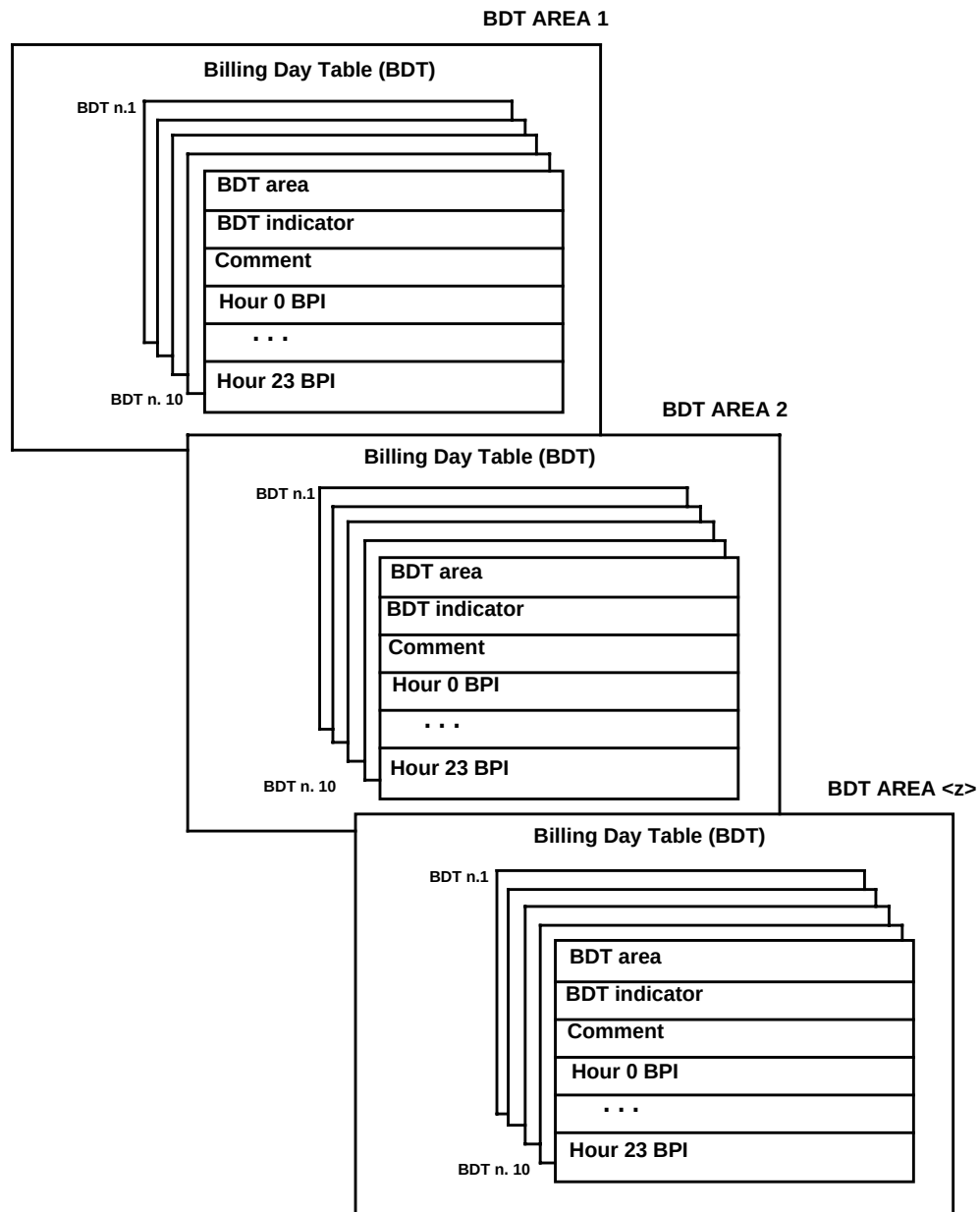


Figure 4-3. The Billing Day Tables

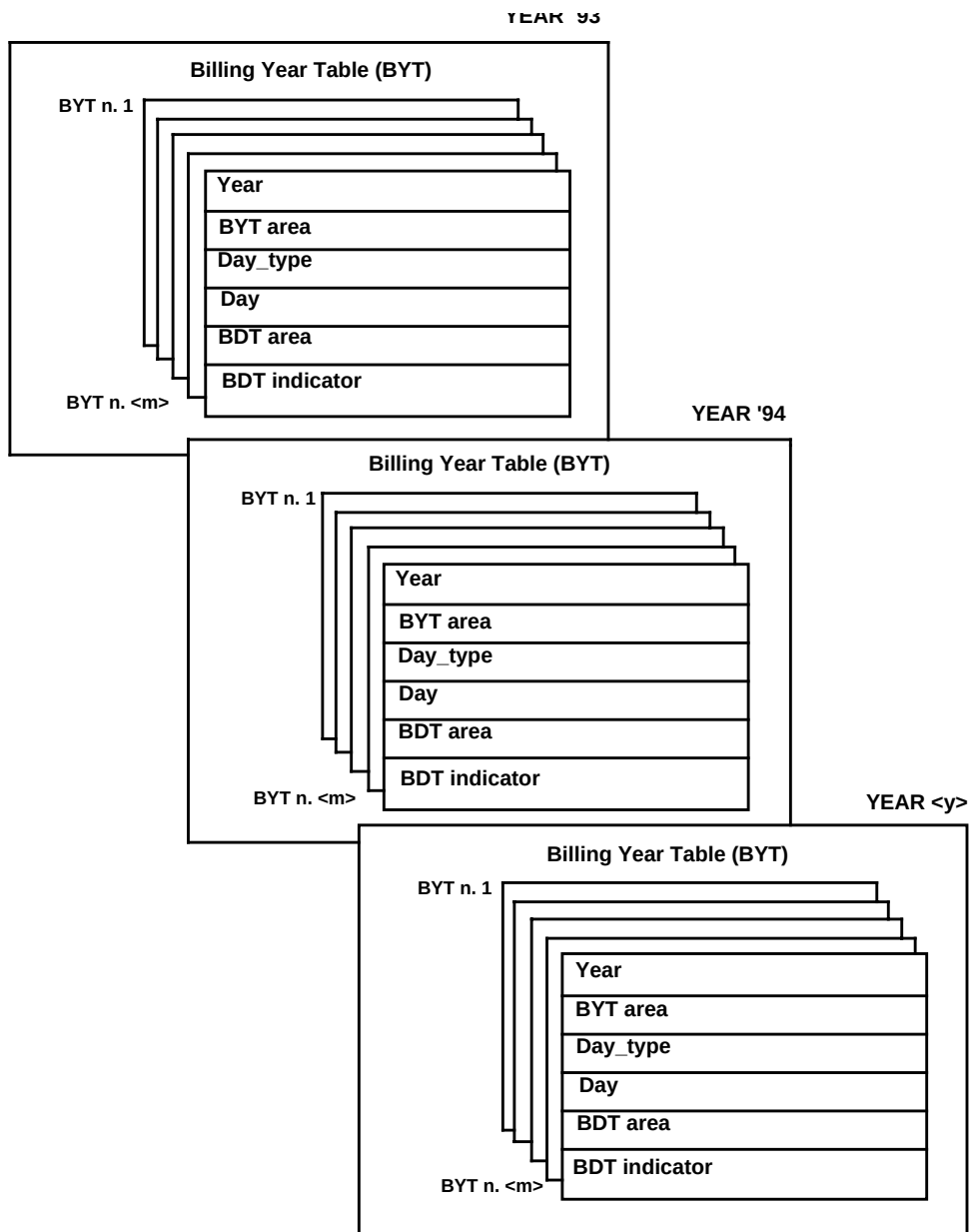


Figure 4-4. The Billing Year Tables

How to Build a Billing Day/Year Table Database

Building the Billing Day/Year Tables database is a four-step process which is started by entering the command **cfbdt** at the *StarKeeper II* NMS prompt or by choosing the option **BDTMGMT** from the main menu of the **SKsh** command. The process consists of entering data into four INFORMIX tables. The data should be entered in the following order:

First you need to define how you want to classify days of the week, as far as billing is concerned. This uses the DAYS form.

Next, you need to define the billing rates on an hour-by-hour basis for each of the day classifications you entered in the first step. This step uses the BDT form.

The third step is to enter which rate structure applies to every day of the year. This uses the BYT form.

The last step is to specify which BDT and BYT to associate with a specific node monitored by your *StarKeeper II* NMS Core System. This uses the BYT-TO-NODE form.

All data is entered using a forms interface, regardless of whether you use the command-line approach or the **SKsh** approach to begin your configuration session. Once you choose a form to work with, it will be the same form for any of the four types of operations that can be performed: add, delete, change or verify.

To bring the proper form to your screen, you must make the proper choices at the BDT & BYT TABLES Ring Menu. If necessary, refer to **Chapter 2** for instructions on making choices and issuing commands while using these menus. The same section also has instructions on how to retrieve data and enter data in fields on these kinds of database forms, with the result of creating, updating, deleting or viewing specific records in the database.



CAUTION:

It is suggested not to run the **cfbdt** command at 4 o'clock in the morning (node time) in order to avoid entering or updating data when *StarKeeper II* NMS is in the process of sending the Billing Day Tables data to the node. The possible updates might be lost because of timing reasons.

As a brief review: while at ring menus, use the space bar to move the highlight bar to the right and use the BACKSPACE to move the bar to the left or use the arrow keys appropriately or choose the first letter of any choice. When the highlight bar is where you want it, press . Also, remember you can use wild cards (the * symbol) to retrieve records for changing, deleting and verifying database records.

Procedure 4-9. How to Enter and Use the cfbdt Command

1. From the *StarKeeper II* NMS prompt, enter **cfbdt** (or enter **SKsh** and choose BDTMGMT from the Main Menu).
2. The BDTMGMT Ring Menu is displayed.

BDT & BYT TABLES: DAYS BDT BYT BYT-TO-NODE Help
one-line help message appears here

Screen 4-13. The BDTMGMT Ring Menu

3. Choose DAYS, BDT, BYT, BYT-TO-NODE or Help.

The Operations Ring Menu is displayed on top of the chosen form.

CONFIGURE A BILLING DAY TABLE: Add Change Delete Verify Help
one-line help message appears here

Screen 4-14. The Operations Ring Menu

4. Choose Add, Change, Delete, or Verify (or Help). When one of the four operational choices is made, the program displays a form to input data (the enter operation) or identify records to be changed, deleted, or verified. Follow the instructions that are displayed on the message line and the one-line help message that appears underneath the form.

There are four types of records accessible from the menu system (DAYS, BDT, BYT and BYT-TO-NODE). To add a record, specify the type of record and then fill in the requested data in the fields of the new form. The data are added to the database when you press **Ctrl g**. To change, delete, or verify a record, enter search criteria in any or all of the fields to identify a collection of records to be verified, or look at and choose the one(s) that you want to change or delete. Start the search for the specified record by pressing **Ctrl g** and perform the desired operation (change, delete or verify) after the records are retrieved from the database. For change or delete, you can only operate on a single record at a time. Since your search criteria may have retrieved more than one record matching the search criteria, you will have to find the record that you want to change or delete by navigating through the set of records.

The first time you enter data in the Billing Day/Year Table database you should enter records in the following order, as described, above:

- a. Enter DAYS type records.
- b. Enter BDT type records.
- c. Enter BYT type records.
- d. Enter BYT-TO-NODE type records.

The DAYS Form

This form allows you to classify the days of the week from a billing point of view. This mechanism does not prevent you from billing a certain day of the year, like a holiday that happens to fall on a weekday, in a different way. You will be able to associate special billing rates to special days of the year when you enter data with the BYT form. All the fields within this form are mandatory.

CONFIGURE A DAY TABLE: Add Change Delete Verify Help
one-line help message appears here

Screen 4-15. The DAYS Ring Menu

- **Day Type** - The identifier (a letter) of a (range of) day(s). Example: a = weekday, b = Saturday, c = Sunday/holiday.
- **Comment** - A description to be associated with the record being entered.
- **Start day of the week** - A number in the range 0-6 (0 = Sunday, 1 = Monday, ..., 6 = Saturday).
- **End day of the week** - A number in the range 0-6 (0 = Sunday, 1 = Monday, ..., 6 = Saturday).

⇒ NOTE:

You cannot define two day types whose ranges intersect. For example if you define a day type "a" with range 1-3, you cannot define a day type "b" with range 3-6 because 3 already belongs within the range of day type "a". This is to avoid ambiguity in the way a certain day of the week should be treated. On the other hand, it is possible to define a day type that has only a single day (for example, Sundays), where the "Start day of the week" (0) would be the same as the "End day of the week".

The BDT Form

This form allows you to define the billing rates to be subsequently associated with the day types defined with the DAYS form. You must first identify the billing areas to be configured then the different types of billing rates within each area. For any billing area defined by the user it is possible to define at most 10 different types of rates. Each rate type is identified by a numeric indicator. All the fields within this form are mandatory.

CONFIGURE A BILLING DAY TABLE: Add Change Delete Verify Help
one-line help message appears here

Screen 4-16. The BDT Ring Menu

BDT DATA

- **Billing Day Table Area** - The area to which the billing rate types have to be associated. This is a number that you choose.
- **Billing Day Table Indicator** - The identifier of a billing rate type. This is also a number.
- **Comment** - A description to be associated with the record being entered.
- **Hour 0 BPI** - The Billing Period Indicator in the range 1-3 for hour 0-1.
- **Hour 23 BPI** - The Billing Period Indicator in the range 1-3 for hour 23-24.
- Hour 0 corresponds to MIDNIGHT through 12:59AM. Hour 23 corresponds to 11:00PM through 11:59PM.

The BYT Form

This form allows you to associate previously defined billing rate types to every day of the year. Because of the day classification entered with the DAYS form, it is possible to treat days that belong to the same category in the same way. Therefore it is possible to enter the billing rate type for all the days that belong to the same category. However some days of the year may be treated in a special way with respect to the days that otherwise would have been in the same category. Typically this happens when a weekday is considered to be a holiday. In this case this special day is explicitly entered in the database by entering a record which is marked with the specific date of the year in order to discriminate between this day and any regular day belonging to the same category.

CONFIGURE A BILLING YEAR TABLE: Add Change Delete Verify Help
one-line help message appears here

Screen 4-17. The BYT Ring Menu

BYT DATA

- **Year** - The year for which the Billing Year Table data are entered. This field is mandatory.
- **Billing Year Table Area** - The identifier of a geographical area to represent the way its billing is handled. This identifier is a number. An identifier may cover a geographical area as wide as a country, a region, or a state inside a country. This field is mandatory.
- **Day Type** - A day type or category as defined using the DAYS form. If the Day field is NULL (see the description of the next field), this field is mandatory.
- **Day of the month** - A precise day of the year. The format is MMDD (two digit month, concatenated with two digit day within the month). This field needs to be entered if the specified day needs to be treated differently with respect to the days that belong to the same category (day type). This field can be NULL.

- **Billing Day Table Area** - A BDT area. This field is related to the following one. A BDT area plus a BDT indicator uniquely identify a billing rate type in case more than one area is entered in the database. This field is mandatory.
- **Billing Day Table Indicator** - A number in the range 1-10 to identify a billing rate type within a billing area. This field is mandatory.

The BYT-TO-NODE Form

This form allows you to associate Billing Day/Year Tables data to specific nodes configured in the *StarKeeper II* NMS database. All the fields are mandatory.

CONFIGURE A BILLING YEAR TABLE: Add Change Delete Verify Help
one-line help message appears here

Screen 4-18. The BYT-TO-NODE Ring Menu

BYT-TO-NODE DATA

- **System/Node name** - The name of the node to which a Billing Year Table must be associated. Enter the same name entered through the **cf** command.
- **Year** - The year for which the association of a Billing Year Table to a node is being made.
- **Billing Year Table Area** - The actual Billing Year Table to be associated to the node. This data together with the year uniquely identify a Billing Year Table.

Sample Billing Data Configuration

To illustrate how the configuration of billing data works, consider the following sample network and associated information about rates and holidays.

- There are two geographical areas: AreaA and AreaB. Each area is served by one node. In AreaA, the name of the node is nodea. In AreaB, the name of the node is nodeb. Both nodes are managed by the same *StarKeeper II* NMS Core System.
- All weekdays (Monday through Friday) should be treated the same for both areas. The rates should be:

08:00AM to 05:00PM	BPI=3
05:00PM to 10:00PM	BPI=2
10:00PM to 08:00AM	BPI=1

- All Saturdays should be treated the same for both areas. The rates should be:
08:00AM to 10:00PM BPI=2
10:00PM to 08:00AM BPI=1
- All Sundays should be treated the same for both areas. The rates should be:
12:00AM (MIDNIGHT) to 12:00AM (MIDNIGHT) BPI=1
- December 25, 1996 and December 25, 1997 are holidays, to be treated as Sundays, for both areas.
- November 25, 1996 and November 24, 1997 are holidays, to be treated as Sundays, for both areas.
- November 26, 1996 and November 25, 1997 are holidays, to be treated as Saturdays, for both areas.
- AreaA celebrates a holiday on May 30, 1996 and May 30, 1997, to be treated as Sundays, but AreaB does not celebrate that holiday.

Setting Up the Billing Day/Year Tables Database

There are four steps used when setting up the Billing Day/Year Tables Database.

1. The first step is to define the DAYS entries. This is done by entering three records:

The following record corresponds to weekdays. Its "tag" is a "w".

Field	Value	Description
Day Type	w	
Comment	Weekday	
Start day of the week	1	1 = Monday
End day of the week	5	5 = Friday

Screen 4-19. DAYS Form for Weekdays

The following record corresponds to Saturdays. Its "tag" is an "s".

Field	Value	Description
Day Type	s	
Comment	Saturday	
Start day of the week	6	6 = Saturday
End day of the week	6	6 = Saturday

Screen 4-20. DAYS Form for Saturdays

The following record corresponds to Sundays. Its "tag" is an "h".

Field	Value	Description
Day Type	h	
Comment	Sunday	
Start day of the week	0	0 = Sunday
End day of the week	0	0 = Sunday

Screen 4-21. DAYS Form for Sundays

2. The second step is to enter BDT records. For AreaA, you can use a value for the BDT area equal to "1", and for AreaB, you can use a value for the BDT area equal to "2". You will need three records for AreaA and three records for AreaB.

The following record corresponds to Weekdays for AreaA.

Field	Value	Description
Billing Day Table Area	1	AreaA
Billing Day Table Indicator	1	Descriptor for weekday
Comment	Weekday	Weekdays Billing Day Table
Hour 0 BPI	1	
Hour 1 BPI	1	
Hour 2 BPI	1	
Hour 3 BPI	1	
Hour 4 BPI	1	
Hour 5 BPI	1	
Hour 6 BPI	1	
Hour 7 BPI	1	
Hour 8 BPI	3	
Hour 9 BPI	3	
Hour 10 BPI	3	
Hour 11 BPI	3	
Hour 12 BPI	3	
Hour 13 BPI	3	
Hour 14 BPI	3	
Hour 15 BPI	3	
Hour 16 BPI	3	
Hour 17 BPI	2	
Hour 18 BPI	2	
Hour 19 BPI	2	
Hour 20 BPI	2	
Hour 21 BPI	2	
Hour 22 BPI	1	
Hour 23 BPI	1	

Screen 4-22. BDT Form for Weekdays, for AreaA

The following record corresponds to Weekdays for AreaB.

Field	Value	Description
Billing Day Table Area	2	AreaB
Billing Day Table Indicator	1	Descriptor for weekday
Comment	Weekday	Weekdays Billing Day Table
Hour 0 BPI	1	
Hour 1 BPI	1	
Hour 2 BPI	1	
Hour 3 BPI	1	
Hour 4 BPI	1	
Hour 5 BPI	1	
Hour 6 BPI	1	
Hour 7 BPI	1	
Hour 8 BPI	3	
Hour 9 BPI	3	
Hour 10 BPI	3	
Hour 11 BPI	3	
Hour 12 BPI	3	
Hour 13 BPI	3	
Hour 14 BPI	3	
Hour 15 BPI	3	
Hour 16 BPI	3	
Hour 17 BPI	2	
Hour 18 BPI	2	
Hour 19 BPI	2	
Hour 20 BPI	2	
Hour 21 BPI	2	
Hour 22 BPI	1	
Hour 23 BPI	1	

Screen 4-23. BDT Form for Weekdays, for AreaB

The following record corresponds to Saturdays for AreaA.

Field	Value	Description
Billing Day Table Area	1	AreaA
Billing Day Table Indicator2		Descriptor for Saturday
Comment	Saturday	Saturdays Billing Day Table
Hour 0 BPI	1	
Hour 1 BPI	1	
Hour 2 BPI	1	
Hour 3 BPI	1	
Hour 4 BPI	1	
Hour 5 BPI	1	
Hour 6 BPI	1	
Hour 7 BPI	1	
Hour 8 BPI	2	
Hour 9 BPI	2	
Hour 10 BPI	2	
Hour 11 BPI	2	
Hour 12 BPI	2	
Hour 13 BPI	2	
Hour 14 BPI	2	
Hour 15 BPI	2	
Hour 16 BPI	2	
Hour 17 BPI	2	
Hour 18 BPI	2	
Hour 19 BPI	2	
Hour 20 BPI	2	
Hour 21 BPI	2	
Hour 22 BPI	1	
Hour 23 BPI	1	

Screen 4-24. BDT Form for Saturdays, for AreaA

The following record corresponds to Saturdays for AreaB.

Field	Value	Description
Billing Day Table Area	2	AreaB
Billing Day Table Indicator2		Descriptor for Saturdays
Comment	Saturday	Saturdays Billing Day Table
Hour 0 BPI	1	
Hour 1 BPI	1	
Hour 2 BPI	1	
Hour 3 BPI	1	
Hour 4 BPI	1	
Hour 5 BPI	1	
Hour 6 BPI	1	
Hour 7 BPI	1	
Hour 8 BPI	2	
Hour 9 BPI	2	
Hour 10 BPI	2	
Hour 11 BPI	2	
Hour 12 BPI	2	
Hour 13 BPI	2	
Hour 14 BPI	2	
Hour 15 BPI	2	
Hour 16 BPI	2	
Hour 17 BPI	2	
Hour 18 BPI	2	
Hour 19 BPI	2	
Hour 20 BPI	2	
Hour 21 BPI	2	
Hour 22 BPI	1	
Hour 23 BPI	1	

Screen 4-25. BDT Form for Saturdays, for AreaB

The following record corresponds to Sundays for AreaA.

Field	Value	Description
Billing Day Table Area	1	AreaB
Billing Day Table Indicator	3	Descriptor for Sunday
Comment	Sunday	Sundays Billing Day Table
Hour 0 BPI	1	
Hour 1 BPI	1	
Hour 2 BPI	1	
Hour 3 BPI	1	
Hour 4 BPI	1	
Hour 5 BPI	1	
Hour 6 BPI	1	
Hour 7 BPI	1	
Hour 8 BPI	1	
Hour 9 BPI	1	
Hour 10 BPI	1	
Hour 11 BPI	1	
Hour 12 BPI	1	
Hour 13 BPI	1	
Hour 14 BPI	1	
Hour 15 BPI	1	
Hour 16 BPI	1	
Hour 17 BPI	1	
Hour 18 BPI	1	
Hour 19 BPI	1	
Hour 20 BPI	1	
Hour 21 BPI	1	
Hour 22 BPI	1	
Hour 23 BPI	1	

Screen 4-26. BDT Form for Sundays, for AreaA

The following record corresponds to Sundays for AreaB.

Field	Value	Description
Billing Day Table Area	2	AreaB
Billing Day Table Indicator	3	Descriptor for Sunday
Comment	Sunday	Sundays Billing Day Table
Hour 0 BPI	1	
Hour 1 BPI	1	
Hour 2 BPI	1	
Hour 3 BPI	1	
Hour 4 BPI	1	
Hour 5 BPI	1	
Hour 6 BPI	1	
Hour 7 BPI	1	
Hour 8 BPI	1	
Hour 9 BPI	1	
Hour 10 BPI	1	
Hour 11 BPI	1	
Hour 12 BPI	1	
Hour 13 BPI	1	
Hour 14 BPI	1	
Hour 15 BPI	1	
Hour 16 BPI	1	
Hour 17 BPI	1	
Hour 18 BPI	1	
Hour 19 BPI	1	
Hour 20 BPI	1	
Hour 21 BPI	1	
Hour 22 BPI	1	
Hour 23 BPI	1	

Screen 4-27. BDT Form for Sundays, for AreaB

- The third step is to construct records for the BYT. You will need records for 1996 and for 1997. You will need records that correspond to AreaA and records that correspond to AreaB. Almost all the records for AreaA will be entered for AreaB, except for those corresponding to the May holidays that are only celebrated in AreaA. Screens 4-28 through 4-54 illustrate a sample setup.

Field	Value	Description
Year	96	
Billing Year Table Area	1	AreaA
Day Type	w	
Day of the Month		Not Necessary
Billing Day Table Area	1	AreaA
Billing Day Table Indicator	1	Indicator associated with weekday.

Screen 4-28. BYT Form for AreaA, 1996, Weekdays

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaB
Day Type	w	
Day of the Month		Not Necessary
Billing Day Table	Area2	AreaB
Billing Day Table Indicator	1	Indicator associated with weekday.

Screen 4-29. BYT Form for AreaB, 1996, Weekdays

Field	Value	Description
Year	96	
Billing Year Table	Area1	AreaA
Day Type	s	Saturday
Day of the Month		Not Necessary
Billing Day Table	Area1	AreaA
Billing Day Table Indicator	2	Indicator associated with weekday.

Screen 4-30. BYT Form for AreaA, 1996, Saturdays

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaB
Day Type	s	Saturday
Day of the Month		Not Necessary
Billing Day Table	Area2	AreaB
Billing Day Table Indicator	2	Indicator associated with weekday.

Screen 4-31. BYT Form for AreaB, 1996, Saturdays

Field	Value	Description
Year	96	
Billing Year Table	Area1	AreaA
Day Type	h	Holiday
Day of the Month		Not Necessary
Billing Day Table	Area1	AreaA
Billing Day Table Indicator	3	Indicator associated with Sunday.

Screen 4-32. BYT Form for AreaA, 1996, Sundays and Holidays

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaB
Day Type	w	Holiday
Day of the Month	1225	Not Necessary
Billing Day Table	Area1	AreaB
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-33. BYT From for AreaB, 1996, Sundays and Holiday

Field	Value	Description
Year	96	
Billing Year Table	Area1	AreaA
Day Type	w	Weekday
Day of the Month	1225	Christmas - 25 December
Billing Day Table	Area1	AreaA
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-34. BYT Form for AreaA, December 25, 1996

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaB
Day Type	w	Weekday
Day of the Month	1225	Christmas - 25 December
Billing Day Table	Area2	AreaB
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-35. BYT Form for AreaB, December 25, 1996

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaA
Day Type	w	Weekday
Day of the Month	1125	Thanksgiving - 25 November
Billing Day Table	Area2	AreaA
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-36. BYT Form for AreaA, November 25, 1996

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaB
Day Type	w	Weekday
Day of the Month	1125	Thanksgiving - 25 November
Billing Day Table	Area2	AreaB
Billing Day Table Indicator	3	Indicator associated with Sunday.

Screen 4-37. BYT Form for AreaB, November 25, 1996

Field	Value	Description
Year	96	
Billing Year Table	Area1	AreaA
Day Type	w	Weekday
Day of the Month	1126	Day After Thanksgiving - 26 Nov.
Billing Day Table	Area1	AreaA
Billing Day Table Indicator	3	Indicator associated with Sunday.

Screen 4-38. BYT Form for AreaA, November 26, 1996

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaB
Day Type	w	Weekday
Day of the Month	1126	Day After Thanksgiving - 26 Nov.
Billing Day Table	Area2	AreaB
Billing Day Table Indicator	3	Indicator associated with Sunday.

Screen 4-39. BYT Form for AreaB, November 26, 1996

Field	Value	Description
Year	96	
Billing Year Table	Area1	AreaA
Day Type	w	Weekday
Day of the Month		Not Necessary
Billing Day Table	Area1	AreaA
Billing Day Table Indicator	1	Indicator associated with weekday.

Screen 4-40. BYT Form for AreaA, 1996, Weekdays

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaB
Day Type	w	Weekday
Day of the Month		Not Necessary
Billing Day Table	Area2	AreaB
Billing Day Table Indicator	1	Indicator associated with weekday.

Screen 4-41. BYT Form for AreaB, 1996, Weekdays

Field	Value	Description
Year	97	
Billing Year Table	Area1	AreaA
Day Type	s	Saturday
Day of the Month		Not Necessary
Billing Day Table	Area1	AreaA
Billing Day Table Indicator	2	Indicator associated with Saturday.

Screen 4-42. BYT Form for AreaA, 1997 Saturdays

Field	Value	Description
Year	97	
Billing Year Table	Area2	AreaB
Day Type	s	Saturday
Day of the Month		Not Necessary
Billing Day Table	Area2	AreaB
Billing Day Table Indicator	2	Indicator associated with Saturday.

Screen 4-43. BYT Form for AreaB, 1997, Saturdays

Field	Value	Description
Year	97	
Billing Year Table	Area1	AreaA
Day Type	h	Holiday
Day of the Month		Not Necessary
Billing Day Table	Area1	AreaA
Billing Day Table Indicator	3	Indicator associated with Sunday.

Screen 4-44. BYT Form for AreaA, 1997, Sundays and Holidays

Field	Value	Description
Year	97	
Billing Year Table	Area2	AreaB
Day Type	h	Holiday
Day of the Month		Not Necessary
Billing Day Table	Area2	AreaB
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-45. BYT Form for AreaB, 1997, Sundays and Holidays

Field	Value	Description
Year	97	
Billing Year Table	Area1	AreaA
Day Type	w	Weekday
Day of the Month	1225	Christmas - 25 December
Billing Day Table	Area1	AreaA
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-46. BYT Form for AreaA, December 25, 1997

Field	Value	Description
Year	97	
Billing Year Table	Area2	AreaB
Day Type	w	Weekday
Day of the Month	1225	Christmas - 25 December
Billing Day Table	Area2	AreaB
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-47. BYT Form for AreaB, December 25, 1997

Field	Value	Description
Year	97	
Billing Year Table	Area1	AreaA
Day Type	w	Weekday
Day of the Month	1124	Thanksgiving - 24 November
Billing Day Table	Area1	AreaA
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-48. BYT Form for AreaA, November 24, 1997

Field	Value	Description
Year	97	
Billing Year Table	Area2	AreaB
Day Type	w	Weekday
Day of the Month	1124	Thanksgiving - 24 November
Billing Day Table	Area2	AreaB
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-49. BYT Form for AreaB, November 24, 1997

Field	Value	Description
Year	97	
Billing Year Table	Area1	AreaA
Day Type	w	Weekday
Day of the Month	1125	Day After Thanksgiving - 25 Nov.
Billing Day Table	Area1	AreaA
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-50. BYT Form for AreaA, November 25, 1997

Field	Value	Description
Year	97	
Billing Year Table	Area2	AreaA
Day Type	w	Weekday
Day of the Month	1125	Day After Thanksgiving - 25 Nov.
Billing Day Table	Area2	AreaA
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-51. BYT Form for AreaB, November 25, 1997

Field	Value	Description
Year	96	
Billing Year Table	Area1	AreaA
Day Type	w	Weekday
Day of the Month	0530	Special May Day - 30 May
Billing Day Table	Area1	AreaA
Billing Day Table Indicator3		Indicator associated with Sunday.

Screen 4-52. BYT Form for AreaA, May 30, 1996

Field	Value	Description
Year	96	
Billing Year Table	Area2	AreaB
Day Type	w	Weekday
Day of the Month	0530	Special May Day - 30 May
Billing Day Table	Area2	AreaB
Billing Day Table Indicator	3	Indicator associated with Sunday.

Screen 4-53. BYT Form for AreaA, May 30, 1996

4. The last step is to construct the BYT-TO-NODE records. There are four:

Field	Value	Description
System/Node name	nodea	
Year	96	
Billing Year Table	Area1	AreaA

Screen 4-54. BYT-TO-NODE Form nodea, 1996

Field	Value	Description
System/Node name	nodea	
Year	97	
Billing Year Table	Area1	AreaA

Screen 4-55. BYT-TO-NODE Form nodea, 1997

Field	Value	Description
System/Node name	nodeb	
Year	96	
Billing Year Table	Area1	AreaA

Screen 4-56. BYT-TO-NODE Form nodeb, 1996

Field	Value	Description
System/Node name	nodeb	
Year	97	
Billing Year Table	Area1	AreaA

Screen 4-57. BYT-TO-NODE Form nodeb, 1997

Converting Your Database

This section describes the procedures for converting your database after installing a new release of *StarKeeper II NMS*.

⇒ NOTE:

Throughout this section we present example output for a database conversion from an R8.0 system to an R10.0 system. Use your actual release numbers in a similar manner.

You will need to perform a *local* conversion if you upgraded your machine to a new *StarKeeper II NMS* release. You will need to perform a *remote* conversion if you installed a new *StarKeeper II NMS* on a different type of host machine from the one containing your previous release.

During conversion you are given the option to convert any Partitioned Users. Conversion will find all Partitioned Users and move the current home directory to *user.o*. It then redefines the user using the *StarKeeper II NMS* command **DefineUser**, and permits that user, via the **Permit** command, to access any command they had access to under the original login. It also sets up printer information as previously defined. If you customize your Partitioned Users logins (for example, modify the *.profile*, add special commands to the *.permit* directory), these special modifications will not be carried forward to the converted logins. You are responsible for handling any modifications you may want beyond the standard Partitioned User logins. For your reference the old login setup is stored under the *user.o* directory.

⇒ NOTE:

Conversion identifies Partitioned Users by the word "Partition" in the comment field of the user's */etc/passwd* file entry. If this entry has been changed by the user or system administrator, the Partitioned User will not be converted.

Database Conversion Procedures

⇒ NOTE:

This section assumes that you have a complete backup of the filesystem where the previous version of *StarKeeper II NMS* resides.

Local Database Conversion

This subsection provides procedures for performing a local database conversion on the same host computer.

Procedure 4-10. Local Database Conversion

⇒ NOTE:

Be sure *StarKeeper II* NMS is shut down before beginning the conversion.

1. Log in as **cnmsadm** and press .
2. Set the PATH variable to **PATH=\$PATH:\$CNMS_LIB/conversion** and press .
3. Enter **CONVERT** and press at the SK: prompt. Follow the instructions in the screen:
 - a. Enter **n** and press .
 - b. Enter the release number of your previous *StarKeeper II* NMS system and press .
 - c. Enter the name of your previous *StarKeeper II* NMS database directory and press .

```
*****
*                                     *
*               Beginning Conversion   *
*                                     *
*****

Loading Conversion programs ...
Conversion programs loaded.
Are you upgrading from a different machine? [y, n, q: +(n)]: n
Please enter previous StarKeeper II NMS release number:
[7.0, 8.0, 9.0: +(9.0)]: 8.0
Please enter StarKeeper II NMS R8.0 database directory;
[+(/usr2/SK/r8.0/dbs)]:
```

4. A series of messages appear announcing various table deletions and conversions. After the system announces it has completed the database conversion successfully, press when prompted.

5. If you have Partitioned Users, follow the prompts on the screen to complete database conversion as shown below.

```

Do you want to convert your Partitioned Users? [y, n: +(y)]: y
Enter the root password to convert Partitioned User data.
Password:

*****
*                                     *
*           Converting Partitioned Users           *
*                                     *
*****

Finished.
** After your connections have come up, be sure to run skload and
** sk_sync as appropriate. Refer to the StarKeeper II NMS Core System Guide
** for instructions to complete the setup of your configuration data.

SK:

```

Database conversion on the same host computer is now complete. Be sure to run the **skload** command after every database conversion. If SMDS customers run **skload** with the **all** option, information associated with an inactive node may be deleted. To avoid this problem, SMDS customers should not run **skload -n all** right after an upgrade; rather, they should run it on a node by node basis or several nodes at a time.

Remote Database Conversion

This subsection provides procedures for performing a remote database conversion on different host computers. Throughout this procedure, the term *local* will be used to refer to your new host machine, R10.0 in these examples, to which you are converting your database. The term *remote* will be used to refer to your previous machine, R8.0 in these examples.

Procedure 4-11. Remote Database Conversion

⇒ NOTE:

Be sure *StarKeeper II* NMS is shut down on the remote and local machines before beginning the conversion. Also, ensure that you have a host connection configured for your old and new machines; see **Appendix E**.

1. Log in as **cnmsadm** on the remote machine and press .
2. Enter **su root** and press .
3. Enter **mkdir /usr/conv** to create a directory called **/usr/conv**. You must be **root** to create this directory. Change the access permissions of the directory to 777 by entering **chmod 777 /usr/conv** and pressing .
4. The next step requires using the **pull** command to move the **c_unload** and **mk_pufile** programs from the **/usr2/SK/r10.0/lib/conversion** directory on the local machine into the **/tmp** directory of the remote machine.

Assume that the local machine is called *area/exch/machine10_0*, and the remote machine is called *area/exch/machine8_0*.

To authorize yourself to be able to pull files from the local machine, enter the following commands on the remote machine:

- a. Enter **Ctrl** **d** and press **Return** from the `root` login to the `cnmsadm` prompt (SK).
- b. Change the directory to */tmp* by entering **cd /tmp** and pressing **Return**.
- c. If your remote host machine is a **HP**, enter **/usr/local/bin/dk area/exch/machine10_0.authorize** and press **Return**.

If the **authorize** should fail with the error message **Access denied**, remove the initial **#** character in the following line in */etc/opt/dk/dksrvtab* on the local R10.0 machine to make it executable and substitute the *area/exchange/host* of your local machine for *Area/Exch/*.

⇒ NOTE:

The lines requiring the instructed changes appear as one line on the screen in the file; they are shown as two lines in this guide due to space restrictions.

Then, change

```
# * authorize e/vx root /opt/dk/bin/authorize authorize:Area/Exch/Host :%U:%f
```

to become

```
* authorize e/vx root /opt/dk/bin/authorize authorize:area/exch/machine9_0
```

- d. Enter the `cnmsadm` login_id and password for the local machine. You are now authorized for **push/pull** privileges.

If your remote host machine is an HP system, enter the following two commands:

```
/usr/local/bin/pull area/exch/machine10_0 /usr2/SK/r10.0/lib/conversion/c_unload /tmp
```

```
/usr/local/bin/pull area/exch/machine10_0 /usr2/SK/r10.0/lib/conversion/mk_pufile /tmp
```

If the **pull** should fail with the error message **Access denied**, remove the initial **#** character in the following line in */etc/opt/dk/dksrvtab* on the local R10.0 machine to make it executable and substitute your area and exchange for *Area/Exch/**. Then, change

```
#Area/Exch/*! pupu R/b & /opt/dk/bin/pupu pupu:from:%f
```

to become

```
area/exch/* pupu R/b & /opt/dk/bin/pupu pupu:from:%f
```

5. Enter **/tmp/c_unload** at the SK prompt and press . Enter the root directory name at the prompt and press .
6. The following screen appears. Enter the *StarKeeper II* NMS root directory name and press .

Please enter *StarKeeper II* NMS root directory, or q to quit.
[/usr2/SK/r8.0, q: +(/usr2/SK/r8.0):

7. A message similar to the following appears.

CNMS Root directory is /usr2/SK/r8.0.
Database Base Directory is /usr2/SK/r8.0/dbs.
Unloading database tables into /usr/conv directory ... finished.

If you have partitioned users, you will also receive a message similar to the following. Supply the requested information.

Unloading Partitioned User data into /usr/conv directory ...
Please enter root password
Password:

8. Log in to the local (R10.0) machine as **cnmsadm** and set the PATH variable to **PATH=\$PATH:\$CNMS_LIB/conversion** and press .
9. You must authorize yourself to be able to pull files from the remote machine. Enter the following commands on the local machine.
 - a. For your local host machine, an HP system, enter **/opt/dk/bin/dk area/exch/machine8_0.authorize** and press .
 - b. Enter the cnmsadm login_id and password for the remote machine. You are now authorized for **push/pull** privileges.
10. Run the **c_pull** program from the local machine. Enter **c_pull** at the SK prompt on the local machine. If a push/pull directory does not already exist, complete the steps in the following screen:
 - a. Enter the root password and press .

A push/pull directory should exist as a communication area between machines.
Please enter root password to create this directory.
Password:
Directory "/usr2/SK/r10.0/dbs/OLD" created.

- b. Enter the dialstring for the remote machine where the previous release of *StarKeeper II* NMS is stored (**area/exch/machine8_0**) and press .

Please enter dialstring for the remote machine where the previous generic *StarKeeper II* NMS is stored:

The following error messages may appear. Ignore this message; it is not a problem.

```
Cannot chmod "/usr2/SK/r10.0/dbs/OLD." to <errno:1>.
0 blocks
```

The following messages should appear. If they do not, *c_pull* has failed.

```
c_pull finished successfully.
You may now run create_ld to re-create old database.
```

11. Enter **create_ld** at the SK: prompt on the local machine and press .
12. Complete the instructions as follows:
 - a. Enter the release number of the remote system, and press .

```
Please enter old StarKeeper release number [7.0, 8.0, 9.0: +(9.0)]:8.0
```

13. A message similar to the following appears.

```
Creating release 8.0 database for conversion ... finished.
Loading data into release 8.0 database ... finished
create_ld finished successfully
```

14. Enter **CONVERT** at the SK: prompt and press . Complete the instructions in the following screen:
 - a. Enter **y** and press .
 - b. Enter **y** and press .
 - c. Enter the release number of the remote system, for example, 8.0, and press . Enter the directory of the old database you are converting.

```
*****
*               Beginning Conversion               *
*****

Loading Conversion programs ...
Conversion programs loaded.

Are you upgrading from a different machine? [y, n, q: +(n)]: y
Have you copied the data from your old machine? [y, n, q: +(y)]: y

Please enter previous StarKeeper II NMS release number:
[7.0, 8.0, 9.0: +(9.0)]: 8.0

Please enter StarKeeper II NMS R8.0 database directory;
[+(/usr2/SK/r10.0/dbs/OLD)]:
```

15. A series of messages may appear if your database is not empty. Enter **y** at the prompt and press .

StarKeeper II NMS R10.0 database has been used, if conversion continues, the configuration data will be deleted and then loaded with the converted data from the old generic.

Do you want to continue? [y, n +(n)]: y

16. A series of messages appear announcing various table deletions and conversions. After the system announces it has completed the database conversion successfully, press when prompted.
17. If you have Partitioned Users, follow the prompts on the previously shown screen titled "Converting Partitioned Users" to complete database conversion.

Database conversion is now complete. Be sure to run the **skload** command after every database conversion.

Using Conversion Log Files

The following section provides procedures for using conversion log files. The procedures apply for conversions on all host machines. There are two different conversion log files located in the `$CNMS_DBS/conv_trx` directory. They are:

- *GG7.0db, G8.0db, G9.0db.*
- *alarm_mods*

The log file records the conversion process. The *alarm_mods* log file provides you with a more detailed description in order to recover from conversion failure.

If a partial conversion is performed, a message similar to the following appears in the log file.

Converting severity table: partial conversion.

If this message does appear, you should look for more information in the *alarm_mods* file.

StarKeeper II NMS allows a network administrator to monitor the operation of an entire network from one central location. A record of network events is received and recorded at the Network Management System in the form of alarms, messages stored in log files, and graphical displays. There is also a method of tracing calls through a network to check network operation. See the following sections for a complete discussion.

Alarms

Alarms are generated when something goes wrong or a reportable event occurs within the monitored network. Monitoring alarms keeps you informed of the performance of the entire network, including the Network Management System(s). The elements of a network (nodes, another NMS, a server, and so forth) and the *StarKeeper II* NMS generate alarms, which are received by an alarm handler. The alarm handler then distributes them to the console screen (if you specify) and to the alarm database (tables in the `$CNMS_DB/ahp` directory). For a simplified sketch, see Figure 5-1.

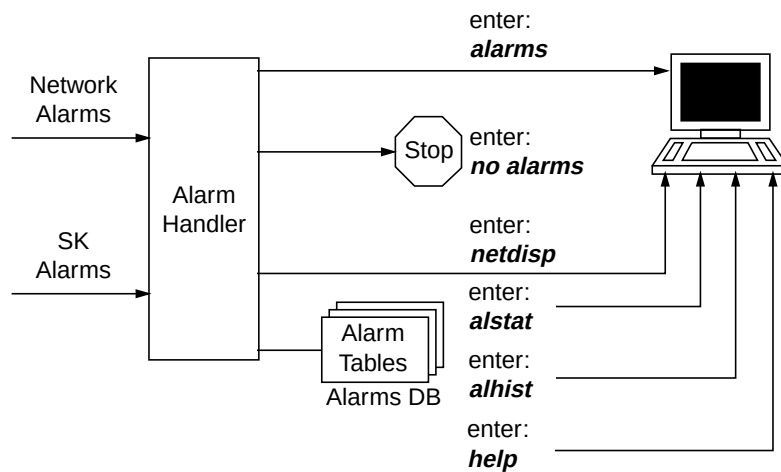


Figure 5-1. Distribution and Retrieval of Alarms

Some alarms report malfunctions that are more severe than others. For this reason all alarms are classified into one of four severity categories; they are: critical, major, minor, and informational. Table 5-1 shows the four severity categories, a definition for each (as they apply to a network node), how they are marked, and when they are cleaned (removed from the alarms database). Alarms from *StarKeeper II* NMS utilize the same four categories. For more information on alarm cleanup refer to **Chapter 7**, the sections titled **Cleaning up Database Tables** and **Cleanup Diagnostics**.

Table 5-1. Alarm Severities

Alarm Severity	Definition	Mark	Cleanup ‡
Critical	the node is inoperative; likely causes are: • loss of power to the node • failure of a critical module • more than one control computer is active	*C	deleted during nightly cleanup only after a specified retention period has passed
Major	a serious, service-degrading condition; likely causes are: • interface module failures, including a blown fuse • environmental extremes, like high temperature in the node cabinet	**	deleted during nightly cleanup only after a specified retention period has passed
Minor	a secondary problem or transient condition that is not likely to affect overall node service, although many minor alarms may indicate a serious condition; likely causes are: • parity errors • FIFO overflows	*	deleted during nightly cleanup
Informational	a system message (not a problem). These alarms are not forwarded to other entities; they are received and stored in the database with a status of <i>cleared</i> .		deleted during nightly cleanup

‡ Most alarms can be cleared manually using the clear command (Link Down alarms are the exception), and some alarms are cleared automatically when the condition no longer exists. All cleared alarms are deleted during nightly cleanup.

From the alarm database you can retrieve alarm data, in differing formats, using *StarKeeper II* NMS commands. See the table below.

Table 5-2. Summary of *StarKeeper II* NMS Alarm Commands

Command	Description
alarms	Directs alarm messages to your screen. (See the section titled Receiving Alarms at Your Screen.) Filters can be used to select which alarms get through and which do not. (See the section titled Alarm Conditioning.)
noalarms	Turns off the alarms command. Alarms will no longer be sent to your screen. Of course they still go to the alarms database for retrieval by the <i>StarKeeper II</i> NMS commands shown below. (See the section titled Receiving Alarms at Your Screen.)
help <ID#>	Displays a full screen of information on the specified alarm, including a recommended course of action. (See the section titled Receiving Alarms at Your Screen.)  NOTE: If the user requests a help file with a message number that contains a B suffix (for example, 1001B) and it does not exist, the user will be shown the contents of the help file without the B suffix (for example, 1001) if the file exists. The information displayed pertains to the alarm number with a B suffix as well as the number without it.
clear	Clears specified alarms from the alarm database. The status of the alarm is changed from "outstanding" to "cleared." (See the section titled Clearing the Alarms.)
alhist	Pulls a list of alarms for the current day, with descriptive data, for the specified network address. Other options are available to specify parameters for the alarms you want to display. (See the section titled Getting a History of Alarms.)
alstat	Pulls a list of alarms, with descriptive data and current status, for the specified network address. Other options are available to specify parameters for the alarms you want to display. (See the section titled Getting a Status Report of Alarms.)
report	Displays or prints a summary report of alarms. (See Chapter 6 , the section titled Alarm Reports.)
netdisp	Pulls a list of <i>StarKeeper II</i> NMS alarms and places the console into a mode where subsequent alarms will be added to the display. (See the section titled Viewing Alarms in the Network Display Mode.) While in netdisp , you can enter stat , setnode , print , or quit . (See the section titled Network Display Internal Commands.)
stat set node print quit	Enter stat to include all network alarms in the one-line summary on the screen. Use setnode <nodename> to direct all shell commands to a desired node. Use print to request a hard copy of the alarm listing from the printer. Use quit (or q) to exit the netdisp mode.
alarm_ui	Calls the Alarm Conditioning Ring Menu to the screen, so you can add, change, delete, or verify your alarm filtering specifications, your alarm severity redefinition specifications, your alarm threshold specifications, and/or your alarm text redefinition specifications. (See the section titled Using the Alarm Conditioning Ring Menus.)

Receiving Alarms at Your Screen

If you want alarms to be sent to your screen as they occur, use the *StarKeeper II* NMS **alarms** command. Simply enter **alarms** at your console. To terminate the **alarms** command, enter **noalarms**.

Observe the following guidelines when using the **alarms** and **noalarms** commands:

1. When you log on, the **alarms** command is not in effect (until you turn it on).
2. Informational alarms are not displayed.
3. More than one **alarms** command can run at any one time, per user ID, using different terminals; however, only one instance can be run at any given terminal.
4. Use the **noalarms** command to turn off your alarms process.
5. You may want to terminate the alarms process (using **noalarms**) before entering a process where receiving alarms will disrupt the screen, such as the SKsh menu system.

You can also set parameters to choose alarms that you wish to receive and ones that you don't want to receive. This choosing of which alarms to see is done through the facilities of filters and thresholding. Filters allow you to specify criteria for alarms you want to see (called positive filters) and alarms you don't want to see (called negative filters). Negative and positive filters are set using the -N <filter name> and -P <filter name> options to the **alarms** command. Run **help** for complete coverage of the **alarms** command. Thresholding allows you to specify how many occurrences of an alarm you want to see; such as, "every fifth occurrence" or "every occurrence after six of them." Refer to the section titled **Alarm Conditioning** for a complete discussion on setting filters and thresholds. The filters also are applicable to the alarms received by the **netdisp** process.

Alarms received at the screen usually carry a few lines of data; the following screen is a typical alarm as it is received at your *StarKeeper II* NMS console.

```
NMS TYPE: SK                      NMS ADDR: star2
NETADDR: national/east/band/NODEA:19
MODTYPE: trkhs                    MSGID: 8005          SEVERITY: MAJOR
LAST OCCURRED: 01-02-98/17:07
MESSAGE: REPORT ALARM: stat: Optical signal error
ACTION: Rec act: Ensure that the fiber is attached
FIRST OCCURRED: 01-01-98/15:06    OCCURRENCES: 28    STATUS: OUTSTANDING
```

Screen 5-1. Typical Alarm Screen Display

If you desire help on any alarm, enter **help** and the alarm message identification number. To get help on alarm 8005, for example, enter **help 8005**. The resulting screen display is shown in Screen 5-2.

```
--ALARM INFORMATION--
-ID-----ALARM/MESSAGE-----
8005 REPORT ALARM: stat: Optical signal error
    Rec act: Make sure that the fiber is attached
    MODADDR=<addr> MODTYPE=<type>
-EXPLANATION-----
The Trunk-HS module received at least two out-of-specification optical signal
errors. A defective fiber optic cable, an unattached cable, or a defective
transmitter on the other side of the fiber could cause an out-of-specification
signal.
-RECOMMENDED ACTION-----
    o Enter "dstat module <addr> high" and check the output of the "OPTICAL
    SIGNAL" field to determine whether a valid optical signal is currently being
    received (yes) or if the module is receiving an out of specification signal (no).
    o Ensure that the fiber is attached.
    o If the problem persists:
    - Follow "Interface Module/Concentrator Diagnostics" procedures in the
      Datakit II VCS Maintenance Guide to diagnose the module and isolate
      the problem.
    - Repair or replace any defective equipment. "Routine Operations" in
      the Datakit II VCS Maintenance Guide provides information for this
      procedure.
```

Screen 5-2. Help Screen for Alarm 8005

Clearing the Alarms

StarKeeper II NMS has four categories of alarms: informational, minor, major, and critical. Informational alarms are logged as cleared as they are received. Active minor alarms are cleared daily at midnight. Active critical and major alarms are retained for a specified number of days before being cleared, as set by the **Alarm Management** function (see **Chapter 3**).

To prevent the system from being flooded with alarms, clear them as they are coming in. We recommend you clear alarms node-by-node instead of all at once. To prevent message queue backups, turn off the alarms process (enter **noalarms**) or exit the netdisp process if the processes are not being used. All clearing methods are explained in the following subsections.

Manual Clearing of Node and StarKeeper Alarms

If old alarms appear in daily reports, the old alarms should be removed. To remove the alarms, use the *StarKeeper* II NMS **clear** command. The format is: **clear <netaddr> <alarmIDs>**. Note that wild carding and anchoring are permitted.

For example: **clear west/957/node20:5/4.2 1097 1101 1104 1105**

The **clear** command issues a reply to the screen in the format: Clear running After 90 seconds, if it still has not received an acknowledgment from the alarm handler, it prints the following message: Clear command timed out. Alarms may still be clearing. This message may be printed when there are many alarms to clear. If you receive this message, use the **alstat** command (in this chapter) to verify that the alarms have changed status from *outstanding* to *cleared*.

The **clear** command clears the alarm(s) and the alarm handler removes them the next time it runs its cleanup process. Run **help** for complete coverage of the **clear** command.

Manual Clearing of Remote NMS Alarms

You can also clear alarms from remote NMSs (that have been cleared from the remote databases) at the local alarm databases with the **clear** command. If you do, be careful to keep alarm databases in synchronization. Use the following format: **clear [NMSaddress]<netaddr> <alarmID>**. The use of wild cards is not supported in the NMS address; also note that the brackets are a required entry and there is no space between the NMS address and the netaddr. (See **Chapter 1** for a discussion of **netaddr**.) For example, suppose you received an alarm number 1911 from module 5 in a node named *nodeC* forwarded by a remote NMS called *star3*, and you wanted to clear it from the alarms database in *star1*. At *star1* you would enter:

clear [star3]nodeC:5 1911

⇒ NOTE:

The convention in *StarKeeper* II NMS guides is to show optional entries in brackets "[]"; however, with **clear**, the NMSaddress, if used, must be entered in actual brackets. Here are two example command entries, the first uses the NMS address and the second does not: **clear [star2]silver:6 1807** or **clear gold:4 1807**

Address expansion (for example, *silver* is known to mean the *national/west/garden/silver* node) is permitted.

Automatic Clearing of Alarms

Certain alarms received from the node are automatically cleared when the alarm condition is repaired. In those instances, the node issues a clearing message to the *StarKeeper II* NMS console. For example, suppose there is a problem with the clock module on a node and the node cannot "find" the module. The node then issues the following message to *StarKeeper II* NMS.

1029 REPORT ALARM: Clock module moved or disappeared

When the problem is repaired the alarm is cleared automatically, and the following clearing message is sent to *StarKeeper II* NMS.

1609 REPORT STATUS: stat: Clock module found

The alarms and clearing messages are logged in the alarms database, allowing you to view that information as an aid to troubleshooting and maintenance.

A complete list of the current clearing messages (Message IDs), and the alarms that they clear (ids), is shown in the *\$INPUT/alarm_act* file. To view this file, change directory to *\$INPUT* and read the *alarm_act* file. Alarms from BNS-2000 nodes have a "B" appended to the msgid number.



CAUTION:

Do not edit the *alarm_act* file.

A few lines in the *alarm_act* file appear as shown in the screen below, which depicts the file for a BNS-2000 node.

#MSGID	ACTION	MAPPING
#		
1091B	MCLEAR	1092B
1605B	MCLEAR	1209B, 1801B
1609B	MCLEAR	1029B, 1039B
1610B	MCLEAR	1212B, 1803B, 1804B

The MSGID column lists the ids of all the auto clearing messages. The MAPPING column lists the ids of the alarms that are cleared by the associated auto clearing message. A '*' in the MAPPING column clears all the active alarms associated with the network address. The ACTION column is MCLEAR for the alarm clearing action of the nodes.

To get more information on either the alarms or the clearing message, enter **help** <msgid#>.

Getting a History of Alarms

To get a listing of alarms and clearing messages collected by the *StarKeeper II* NMS for the current day, use the **alarmhistory** command. Note that this command will list all alarms detected, even if the alarm threshold was not reached. With the command you specify a network address (**netaddr**) and zero or more alarm IDs; command options not specified use default values. The command format is shown below (**alhist** is an accepted abbreviation):

```
alhist [-l <severitylevel>] [-t <timerange>]
      [-S <sortorder>] <netaddr> [<alarmIDs>]
```



NOTE:

The **alarmhistory** command may take a few minutes (or more) to run, depending on how many alarms have been received that day. Please be patient.

A list of options is in Table 5-3; run **help** for complete coverage the **alarmhistory** entry.

Table 5-3. alarmhistory Command Options

Option	Description
[-l <severitylevel>]	A comma-separated specification of severity levels to be displayed. Valid options are critical (c), major (ma), minor (mi), and informational (i).
[-t <timerange>]	The time range in which the alarms have occurred today. The time range is expressed as a beginning and ending time, separated by a hyphen; for example: 10:30-11:30. The time range also can be expressed as a single time; the single time is the beginning of the time range and the end of the time range is the current time. The default time range, if this option is not used, is from the time of the last alarm cleanup to the current time.
[-S <sortorder>]	Specifies the sort order of the output; (t) = by the time of alarm arrival, (s) = by alarm severity (critical, major, minor, informational).
<netaddr>	A required entry that must be a valid network address. Address expansion (for example, <i>silver</i> is known to mean the <i>national/west/garden/silver</i> node) and the use of wild cards is permitted for the nodes only. Specify the full network address for other NMSs or network elements.
[<alarmID>]	The alphanumeric string that identifies the alarm(s). Default is all alarms. Separate alarmIDs by spaces, not commas; the use of wild cards is permitted. Some example alarm IDs are: 1001, 8005, and 18207.

Shown below is an example **alhist** entry:

alhist -l c,ma -t 9:15-11:15 -S s west/957/platinum 1*

The example entry specifies an alarm history for the west/957/platinum node. It checks alarm ID numbers that begin with numeral 1, with severity levels of critical and major, that occurred between 9:15 and 11:15, and sorts them in descending order of severity.

If you enter a nonexistent node name, no error is generated. The only message in this case is Found 0 alarms matching alarm criteria. Be sure you have entered all data correctly on the command line.

As an example, the following screen display is for an alhist entry of:

alhist -l cr,ma,mi silver


```
NETADDR: silver:4
MODTYPE: cpmhs                      MSGID: 1015                      SEVERITY: MAJOR
LAST OCCURRED: 01-01-98/16:11
MESSAGE: REPORT ALARM: Host not connected CAB=0 SLOT=4 HTYPE=cpmhs
ACTION: Rec Act: Check host's cables or power up host computer

NETADDR: silver:4
MODTYPE: N/A                        MSGID: 1135                      SEVERITY: MINOR
LAST OCCURRED: 01-01-98/16:12
MESSAGE: REPORT SYSERR: unix: DEAD SERVER serve1 in slot 4
ACTION: N/A

NETADDR: silver:4
MODTYPE: N/A                        MSGID: 1802                      SEVERITY: MAJOR
LAST OCCURRED: 01-01-98/16:48
MESSAGE: REPORT ALARM: unixcsc: Dead Host in slot 4
ACTION: N/A

NETADDR: silver:4
MODTYPE: N/A                        MSGID: 1135                      SEVERITY: MINOR
LAST OCCURRED: 01-01-98/16:48
MESSAGE: REPORT SYSERR: unix: DEAD SERVER serve1 in slot 4
ACTION: N/A

NETADDR: silver:4
MODTYPE: N/A                        MSGID: 1802                      SEVERITY: MAJOR
LAST OCCURRED: 01-01-98/16:59
MESSAGE: REPORT ALARM: unixcsc: Dead Host in slot 4
ACTION: N/A

Found 5 alarms matching criteria
```

Screen 5-3. Sample alhist Response

To get more information on any alarm, enter *help* and the message ID.

Getting a Status Report of Alarms

To get a listing of alarms that have been collected and retained by *StarKeeper* II NMS along with their current status, use the **alarmstatus** command. Note that this command will list all alarms detected, even if the alarm threshold was not reached. With the command you must specify a network address (netaddr) and zero or more alarm IDs; command options not specified use default values. The command format is shown below (**alstat** is an accepted abbreviation):

```
alstat [-s<status>] [-l <severitylevel>] [-t <timerange>] [-r] [-S <sortorder>]
<netaddr> [<alarmIDs>]
```

An abbreviated list of options is in Table 5-4; run **help** for complete coverage of the **alarmstatus** entry,

Table 5-4. alarmstatus Command Options

Option	Description
[-s <status>]	Specifies the status of the alarms to be displayed; (c) = only display alarms that have been cleared, (o) = only display alarms that are still outstanding.
[-l <severitylevel>]	A comma-separated specification of severity levels to be displayed. Valid options are critical (c), major (ma), minor (mi), and informational (i).
[-t <timerange>]	The time range in which the alarms have occurred today. The time range is expressed as a beginning and ending time, separated by a hyphen; for example: 14:30-15:30. The time range also can be expressed as a single time; the single time is the beginning of the time range and the end of the time range is the current time. The default time range, if this option is not used, is from the time of the last alarm cleanup to the current time.
[-r]	Display alarms from sending NMSs, or other remote entities such as element management systems.
[-S <sortorder>]	Specifies the sort order of the output; (t) = by the time of the last update, (s) = by alarm severity (critical, major, minor, informational).
<netaddr>	A required entry that must be a valid network address. Address expansion (for example, <i>silver</i> is known to mean the <i>national/west/garden/silver</i> node) and the use of wild cards is permitted for nodes only. Specify the full network address for other NMSs or network elements.
[-<alarmID>]	The alphanumeric string that identifies the alarm(s). Default is all alarms. Separate alarm ID by spaces, not commas; the use of wild cards is permitted. Some example alarm IDs are: 1001, 18027, and LD-NMS.

Shown below is an example **alstat** entry:

```
alstat -s o -l c,ma -t 9:15 -S s west/957/platinum 1*
```

The example entry specifies a list of certain outstanding alarms for the west/957/platinum node. It checks alarm ID numbers beginning with numeral 1, with severity levels of critical and major, that occurred between 9:15 and the present time, and sorts them in descending order of severity.

If you enter a nonexistent node name, no error is generated. The only message in this case is Found 0 alarms matching alarm criteria. Be sure you have entered all data correctly on the command line.

As an example, the following screen display is for an **alstat** entry of:

alstat -s o -l ma,mi -S t silver 1802

```
NMS TYPE: SK                      NMS ADDR: star
NETADDR: silver:4
MODTYPE: N/A                      MSGID: 1802      SEVERITY: MAJOR
LAST OCCURRED: 01-01-98/16:59
MESSAGE: REPORT ALARM: unixcsc: Dead Host in slot 4
ACTION: N/A
FIRST OCCURRED: 01-01-98/11:11    OCCURRENCES: 4    STATUS: OUTSTANDING
Found 1 alarms matching criteria
```

Screen 5-4. Sample alstat Response

To get help on any alarm enter **help** <message ID#>.

Viewing Alarms in the Network Display Mode

StarKeeper II NMS has a facility (mode) to view outstanding alarms from the monitored network as they occur and provide access to the SK: prompt at the same time. To enter this mode, type **netdisp**.

The Network Display feature works well with monochrome terminals, but is especially effective with color terminals since it can display alarm severity in colors. Refer to the section titled **Using Color Terminals** for instruction on setting up a color terminal.

Procedure 5-1. How to Enter the Network Display Mode

1. To enter the Network Display program, type **netdisp**. See the list of **netdisp** options following the procedure. These options make the command more specific.

At any time, if the screen becomes garbled or distorted, refresh the screen by pressing Ctrl **p**.
2. The system displays alarm messages from the local *StarKeeper* II NMS. To get alarm messages from a node or another NMS enter **stat** and the address of the NMS or node, or enter **stat all** to get all alarm messages. See the **Network Display Internal Commands** section, next.
3. You can enter system commands from the SK: prompt while you are in **netdisp**. See the section titled **Entering System Commands While in the Network Display Program**.

Table 5-5 has an abbreviated list of the **netdisp** options. Run **help** for full coverage of all the options of the **netdisp** entry.

Table 5-5. netdisp Command Options

Option	Description
[-m]	Prints a multi-line alarm message, omit the -m option to print a one-line alarm message. Screen 5-5 shows an example of a one-line and multi-line alarm message.
[-N <filtername>]	Specifies a negative filter. See the Alarm Filtering discussion in this chapter.
[-P <filtername>]	Specifies a positive filter. See the Alarm Filtering discussion in this chapter.

⇒ **NOTE:**

Alarms pass through only if both the negative *and* positive filters are satisfied. Two rules apply:

1. Alarms are displayed if they match any of the positive criteria, *and* they do not match any of the negative criteria.
2. Alarms are suppressed if they match any of the negative criteria, *or* they fail to match any of the positive criteria.

If the positive and negative filter names are the same, no alarms are accepted by **netdisp**. See the **Defining Alarm Filters** subsection in this chapter.

The following is an example of a one-line netdisp display

```
ENTITY = [star1]CNMS
DATE    TIME    MSG ID    DESCRIPTION
3/13    4:45    10033 [star1]CNMS ** cnms_mon: Process parse (21528)
```

The following is an example of a multi-line netdisp -m display

```
ENTITY = [star1]CNMS
DATE    TIME    MSG ID    DESCRIPTION
3/13    4:45    10033 [star1]CNMS ** cnms_mon: Process parse (21528)
                        terminated abnormally.
```

Screen 5-5. Example Netdisp Alarm Messages

⇒ **NOTE:**

For monochrome terminals, the alarm messages are reverse highlighted; for color terminals, the alarm messages have the background in color.

Network Display Internal Commands

In addition to being able to execute *StarKeeper II* NMS, OS, and network commands (see next subsection), the Network Display program also handles its own set of internal commands. For commands that do not automatically return you to the prompt, press **Enter** to exit the command. Table 5-6 has a summarized description of internal commands. Run **help** for a detailed description of the **netdisp** entry.

Table 5-6. Network Display (netdisp) Internal Commands

Command	Description
print	Prints a copy of the screen on the default printer, which must be connected, in working order, and active. The environment variable LPDEST must be defined for the selected printer, or else you will either see the error message: Print command failed or the screen may hang.
quit or q	Exits the Network Display program.
setnode [<nodeaddr>]	Directs all subsequent commands to the specified node. The network will return the prompt of the specified node until you change nodes through another setnode . If setnode is invoked without an argument, the user's standard prompt (\$PS1) will be used.
stat [[<NMSaddr>]] [<nodeaddr>]	Invokes a dynamically updated display of all the alarms of the network, an NMS, or of a given node, ranging from the most serious (critical) to the least serious (minor). The stat all command first lists the alarms of all nodes and all <i>StarKeeper II</i> NMSs regardless of whatever thresholds are in effect and then lists subsequent alarms based on the threshold criteria that are in effect. You can also specify a node name after the command or direct stat to a specific node by using the setnode command. If the node address is omitted, all alarms for the specified NMS address are displayed. If both NMS address and node address are omitted, only local <i>StarKeeper II</i> NMS alarms are displayed. The stat display may contain multiple pages; press Ctrl f to page forward and Ctrl b to page backward through the display. Stat is also used to display alarms from network element management systems exclusively. Use the -m option to reverse (toggle) the decision on the one-line or multi-line display chosen with the netdisp command. The stat format is: stat [-m] [[<NMSaddress>]][<nodeaddr>]



NOTE:

The convention in *StarKeeper II* NMS guides is to show optional entries in brackets "[]"; however, with **stat**, the NMSaddress, if used, must be entered in actual brackets. Here are two example command entries, the first uses the NMS address and the second does not: **stat -m [star1] silver** or **stat -m silver**.

Entering System Commands While in the Network Display Program

The Network Display program shows the *StarKeeper II* NMS prompt at the bottom of the screen. From this prompt, you can execute virtually (see below) any OS, *StarKeeper II* NMS, or node command *while you are still in the Network Display program*. There is no need to exit **netdisp** to clear an alarm or to troubleshoot a node.



CAUTION:

Do not disconnect(**BREAK** **BREAK**) from a terminal session while **netdisp** is still active. Exit **netdisp** (using **quit** or **q**) before connecting to another terminal session.



NOTE:

If **netdisp** is left running in a held connection, while you connect to another host for example, eventually **netdisp** stops reading messages from the *StarKeeper II* NMS, because it is waiting for the output to the screen to finish. After several minutes of **netdisp** not reading its messages, the *StarKeeper II* NMS terminates **netdisp**.

Do not use **call hold** or **dkcu** while in **netdisp**.

There are occasions when some OS commands will not execute as expected from within the Network Display program. The user interface for **netdisp** appears to be executing a one-line **sh** on the bottom line with the status/message line above it, and the stat display above the status/message line. This may be particularly confusing with built-in shell commands (see **SH** in the *OS User Reference Manual*), especially the **cd** command. When the OS **cd** command is entered, **netdisp** uses a shell to execute the command; then the current directory is changed *for that shell*, not **netdisp**. When the shell returns to **netdisp**, the effects of the **cd** are not shown in **netdisp** (if you execute a **pwd** you will see that the directory has not changed). Other OS commands that may have similar problems are: **export**, **newgrp**, **readonly**, **set**, **ulimit**, **umask**, and **unset**.

To remove **netdisp** alarms use the *StarKeeper II* NMS **clear** command. Refer to a previous section titled **Clearing of Alarms** in this chapter and run **help** for more information. You can clear specified alarms, or use "*" "*" to specify all alarms. Syntax for the **clear** command is shown below:

```
clear [[<NMSAddress>]]<netaddr> <alarmIDs>
```



NOTE:

The convention in *StarKeeper II* NMS guides is to show optional entries in brackets "[]"; however, with **clear**, the NMSAddress, if used, must be entered in actual brackets. Here are two example command entries, the first uses the NMS address and the second does not. **clear [star1]silver:10.4 1007** or **clear platinum 1105 1106 1108**.

Address expansion (for example, *silver* is known to mean the *national/west/garden/silver* node) is permitted. For an explanation of `netaddr`, see the **Network Addressing** section of **Chapter 1**. Wild cards can be used in either the `<netaddr>` or the `<alarm ID>`, but must be contained within quotation marks to prevent shell expansion of the OS. Multiple alarm IDs must be separated by a space.

Using Color Terminals

The appearance of screen attributes (colors) on a terminal depends on the configuration of the OS terminfo package. One special terminfo entry supplied with *StarKeeper II* NMS associates a color with a particular screen attribute.

The color terminals supported for use with **netdisp** are the AT&T AT386, AT&T 329D, and the AT&T KS-22921 L2. The AT&T AT386 and the AT&T 329D do not require any setup instructions; setup instructions for the AT&T KS-22921 L2 are presented in the remainder of this section.

StarKeeper II NMS uses the following color convention with the KS-22921 L2 color terminal:

Color	Indication
RED	Critical alarm
YELLOW	Major alarm
BLUE	Minor alarm
GREEN	Normal operation

To set up the AT&T KS-22921 L2 terminal, first press **SETUP** to go to setup mode. Then press **SHIFT 5** to go into setup B, and make certain to set the following bits, speed, and parity (use the space bar to travel across, and **SHIFT 6** to toggle bits):

1	0100	TX	9600
2	0111	RX	9600
3	0100	P	7S
4	0001	AX	9600
5	0010	P	7S

Use **SHIFT s** to save everything, and press **SETUP** to exit from setup mode.

When logging on, you are asked to specify the type of terminal that you are using. The AT&T KS-22921 L2 (cskssk) is choice number **2**.

For further information about the terminfo database, see the OS *System User Reference Manual*.

Alarm Conditioning

The network administrator can have continuous access to all alarms on the *StarKeeper II* NMS console or terminal as they are received. This can be accomplished by either enabling "alarms" or by using the Network Display program called **netdisp**. The network administrator also can manipulate the way these alarms are displayed by using the *StarKeeper II* NMS Alarm Conditioning feature. Alarm conditioning allows you to:

- filter an alarm (in the database) from being displayed by the **alarms** or **netdisp** commands or from being sent to an external system
- change the severity of an alarm, before it enters the alarm database
- establish a threshold for alarms (in the database) so that the display by the **alarms** or **netdisp** commands or the forwarding to an external system will occur after the threshold has been exceeded.
- redefine the text for an alarm in a format suitable for receiving by an external system

This relationship is illustrated in Figure 5-2.

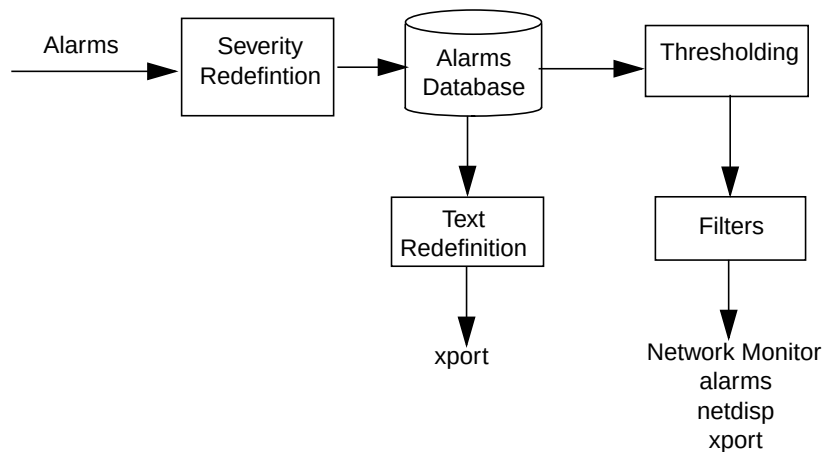


Figure 5-2. Relationship of Alarm Conditioning to the Alarm Database

The listing below shows each type of Alarm Conditioning capability available and a summary of its features.

Filtering

- Suppresses sending of alarms to *StarKeeper* II NMS processes.
- Alarms are still logged in the alarm database, whether or not they are filtered.
- Alarms may be selected to pass through the filter (positive filtering) or to be inhibited from passing (negative filtering), or both.
- Alarms can have multiple criteria. (For example: "Only send Critical alarms that originate from node A and Major alarms that originate from node B. Do not send any alarms that originate from node C.")
- Filtering can be altered while *StarKeeper* II NMS is running.
- System comes with two default filters: a positive filter called *PF1* and a negative filter called *NF1*.



CAUTION:

Do not remove the default filters PF1/NF1. Use the PF1/NF1 filter or define other filters if you want to otherwise affect the flow of alarms.



CAUTION:

Filtered alarms are not automatically cleared.

*Severity
Redefinition*

- Used to promote or demote severity classification of alarms. (For example: Change severity of alarm 1008 from Major to Critical.)
- Severity redefinition can be altered while *StarKeeper* II NMS is running.
- Occurs *before* the alarm is inserted into the alarm database. Alarms are inserted with their new, redefined severity (which changes the cleanup and forwarding scheme accordingly).
- Changing severity changes the alarm cleanup algorithm when the alarm is deleted from the database (see Table 5-1).
- Deleting the severity redefinition causes the next occurrence of the alarm to go back to the default severity.
- Directly affects the alarms database, so alarm reports are impacted as well.

Thresholding

- Suppresses receipt of alarms by all alarm display processes.
- Absolute or modulo thresholding is available.
- Criterion is frequency of occurrence within a specified time interval.
- No alarms are displayed until threshold is reached.
- Alarms are still logged in the alarm database, whether or not threshold is reached.
- Threshold only affects alarm display processes and any external systems.
- Threshold can be redefined while *StarKeeper* II NMS is running.

Text Redefinition

- Applies to sending alarms to an external system.
- Does not apply to any alarm display processes.
- Change text to fit the customer's terminology.
- You must terminate and then restart the xport process for the new/changed records to take effect.
- System comes with default Text Redefinition record called *TF1*.



CAUTION:

Do not remove the default Text Redefinition record *TF1*.

Alarms are conditioned by accessing the database conditioning tables through the SKsh menu system or accessing the tables using the **alarm_ui** forms-entry command. Run **help** for a complete description of how to access forms. As a brief review: while at ring menus press space bar to move the highlight bar to the right and press to move the bar to the left; or, press arrow keys appropriately. When the highlight is where you want it, press to make your selection. Or choose the first letter of any choice.



CAUTION:

The methods of accessing the database just described are the only approved methods. Do not use **isql** commands on the *StarKeeper* II NMS database. There are internal interdependencies among various fields in various tables that cannot be reflected when a field is changed with **isql**. You will corrupt the database and may not be able to salvage the data if you modify the database with **isql** commands.

Using the Alarm Conditioning Ring Menus

All alarm conditioning commands are accessible by using the SKsh menu system or the **alarm_ui** command, as described in Procedure 5-2.

Procedure 5-2. How to Access the Chosen Alarm Conditioning Table (Record)

1. From the SK: prompt, enter **alarm_ui** (or enter **SKsh** and choose ALARMADM from the main menu).
2. The ALARM Ring Menu appears, which looks like this.

```
ALARM: Filter  Severity  Threshold  Redefine_text  Help
** One-line message appears here. See note below **
```

Screen 5-6. Alarm Conditioning Ring Menu

3. The second line (one-line help message) of the Alarm Ring Menus changes depending on the operation you wish to perform. In this guide, a generic message has been supplied in all ring menu examples as a placeholder.
4. Type the first character of the alarm conditioning capability you want to access, or use the space bar to traverse through the ring menu to your choice of alarm conditioning task. As the highlight bar moves, the one-line help message changes to define the current choice. Position the cursor to your choice (Filter Severity Threshold Redefine_text Help) and press to make your selection.
5. The second ring menu (operation) appears. The form of the menu depends on which selection you made on the first ring menu. In any event, the menu is used to choose the add, change, delete, or verify operation for the selected alarm conditioning task. The second ring menu sits on top of a form applicable to the selected alarm conditioning task. To proceed, refer to the next applicable subsection for your selected alarm conditioning task.
6. If you choose Help the following window appears on the screen.

```
ALARM: Filter Severity Threshold Redefine_text Help+-----_+
Display help information| Application help |
                        | Key help          |
                        +-----_--+
Move the highlight bar to the desired choice and type the CONTROL-T keys
```

Screen 5-7. Display Help Information Operations Ring Menu and Record

If you select the Help function, you have a choice of reviewing Application or Key help. Make your selection by using your keyboard space bar to move the highlight bar to your desired choice and press **Ctrl** **t**. When you have finished reviewing the help text, press **Enter** to get back to the ring menu. From this point, use your space bar to move to the alarm conditioning function you want to select or type the first character of the choice.

The following subsections define and provide procedures for using the Operations Ring Menus to:

- define alarm filters (Procedure 5-3)
- redefine alarm severities (Procedure 5-4)
- redefine alarm thresholds (Procedure 5-5)
- redefine alarm text (Procedure 5-6)
- change an alarm conditioning feature (Procedure 5-7)
- delete an alarm conditioning feature (Procedure 5-8)
- verify an alarm conditioning feature (Procedure 5-9)

There are four types of alarm records (filters, severities, thresholds, and text), and four operations that can be done on any type of record (add, change, delete, and verify). To add a record, you specify the type of record and then fill in the requested data in the fields of a new form. The data is added to the database when you press **Ctrl** **g**. To change, delete, or verify a record, you enter search criteria in any or all of the fields to identify a collection of records that you will be able to look at (verify), then choose the one or ones that you want to change or delete. When entering the component address (shown later in this section), you may use wild cards; if you do, the component address cannot exceed 30 characters. Start the search for the specified record by pressing **Ctrl** **g** and perform the desired operation (change, delete, or verify) after the records are retrieved from the database. For change or delete, you can only operate on a single record at a time. Since your search criteria may have retrieved more than one record matching the search criteria, you will have to find the record that you want to change or delete by navigating through the set of records.

Defining Alarm Filters

The Define Alarm Filters feature allows you to select alarms to be passed to alarm display processes, and external systems by permitting some (specified) alarms and suppressing other alarms that you do not want displayed or processed downstream. The specifications are made using filters. Filters reduce alarm traffic within *StarKeeper II* NMS, and avoid swamping target systems or displays with alarms of purely informational or insignificant content.

Consider a filter to be a gate that either lets an alarm pass on to the next step or does not allow the alarm to go on. If you define a filter and invoke it at execution time in a POSITIVE way, if the alarm matches the criteria specified in the filter, that alarm passes on. If it does not match what the filter says, the alarm does not pass on to the next step. An example of passing on to the next step is being displayed on a screen if the **alarms** command is running. If you define a filter and invoke it in a NEGATIVE way, if the alarm matches the criteria specified in the filter, that alarm is not passed on (it is rejected). You can invoke one filter POSITIVELY and another filter NEGATIVELY. The alarm must match the positive filter and not match the negative filter to pass. The alarm can match the negative filter or not match the positive filter to be rejected.

Each filter record has a filter name associated with it. This allows you to define several records together as one filter. Each record that belongs to the same filter name is considered to be one criterion of that filter. Thus you can have any number of records that belong to the same filter by giving them all the same filter name, and you can have many different filters by having sets of filter names. When you have more than one record in a filter, the alarm will pass or be rejected if it matches any one of the records for the filter (invoked positively or negatively, respectively). You can invoke at most one positive filter (with as many records as you need) and one negative filter at once (with as many records as you need).

StarKeeper II NMS is supplied with default filters; PF1 is the positive filter and NF1 is the negative filter. PF1 has one record to match all alarms and NF1 has two records to match all alarms: one for minor alarms and one for informational alarms. Therefore, when PF1 is specified as a positive filter and NF1 is specified as a negative filter, all minor and informational alarms will be suppressed.

**CAUTION:**

Do not delete or alter (change) the default filters PF1/NF1. Be particularly careful when using wild cards to delete or change filter records.

Refer to Procedure 5-3 to define filters for an alarm.

Procedure 5-3. How to Define the Filters for an Alarm

1. Perform the Steps of Procedure 5-2, choosing Filter in Step 4.
2. The Define Alarm Filter Operation Ring Menu and template appears; it appears as follows:

DEFINE ALARM FILTER: Add Change Delete Verify Help
** One-line help message appears here **

Filter name
NMS address
Node address
Component address
Module type
Alarm id
Alarm severity: Critical Major Minor Information
Alarm status: Active Cleared

Screen 5-8. Define Alarm Filter Operation Ring Menu and Record

You have four operation choices while working in this ring menu: add, change, delete, and verify. You also can choose to get help if you want it. Note that using wildcards and anchoring are permitted.

If you want to change a filter, go to Procedure 5-7.

If you want to delete a filter, go to Procedure 5-8.

If you want to verify a filter, go to Procedure 5-9.

Continue this procedure to *add* a filter.

3. At the Define Alarm Filter Operation Ring Menu, press keyboard space bar to move the highlight bar to the Add field of the Operation Ring Menu, and press , or type **a**.

4. The ring menu portion of the screen and the template change according to your selection. The following screen appears if you selected to Add a Filter.

[ADD FILTER]		HELP=<ctrl-o>
Type Ctrl-G to add this filter to the database; DEL for return to menu		
Filter name	<i>Enter name of the filter - ALPHANUMERIC ONLY</i>	
NMS address	ANY	<i>Enter NMS address of module generating alarm</i>
Node address	ANY	<i>Enter node address of module generating alarm</i>
Component address	ANY	<i>Enter component address of module generating alarm</i>
Module type	ANY	<i>Enter module or device type</i>
Alarm id	ANY	<i>Enter alarm id number</i>
Alarm severity:	Critical	Major Minor Information
	Y	Y Y Y
Alarm status:	Active	Cleared
	Y	Y
** One-line help message for each field appears here **		

Screen 5-9. Add Filter Record

5. The first field is for the filter name. Enter it using alphanumeric characters only.
6. Press to finish the entry and proceed to the next field. Each subsequent field is then entered. Note that the remaining fields have the default **ANY**, which you can choose by pressing . Also note that the help line (line 23 on the screen) changes for each field to assist you in making the entry. The help line, for each entry, is reproduced in the screen above using italics to the right of the actual field.

The Node Address is the address of the node (wild carding is permitted); this is the data to the left of the colon in **netaddr**, for example—east/forest/node5. Component address is the address of the component; this is the data to the right of the colon in **netaddr**, for example—east/forest/node5:4.2.27 where 27 is the Data Link Control Identifier (DLCI), on port 2 of module 4 on node east/forest/node5. See **Chapter 1**, the section titled **Addressing**, for more information and an explanation of wild cards and **netaddr**.

The Alarm Severity and Alarm Status fields must be marked Y or N; Y means the entry is part of the criterion, N means it is not.

If you wish to quit the session without having the entries take effect, press . You are returned to the second (Operations) Ring Menu.

7. When you are finished entering data, press **g** to add this record to the database. This action also brings you to the first entry in the next Add Filter operation.

- When you are finished adding filters (the last **Ctrl g**) press **Delete** to return to the second (Operations) Ring Menu.

⇒ NOTE:

Ctrl z will exit the application at any point.

Redefining Alarm Severities

Network nodes produce alarms of four severity types: Critical, Major, Minor, and Informational. Table 5-1 shows the four severity categories, a definition for each and the node and *StarKeeper* II NMS designation (marking).

The Redefine Severity of Alarms feature allows you to redefine the severity of any Critical, Major, Minor, or Informational alarm to any of these same four severity types. For example, you may want all Major, Minor, or Informational alarms generated by a particular module to be designated as Critical alarms.

Refer to Procedure 5-4 to redefine the severity of an alarm.

Procedure 5-4. How to Redefine the Severity of an Alarm

- Perform the Steps of Procedure 5-2, choosing Severity in Step 4.
- The Redefine Severity of Alarms Operation Ring Menu and template appears; it appears as follows:

REDEFINE SEVERITY OF ALARMS: Add Change Delete Verify Help
** One-line help message appears here **

Severity level
NMS name
Node address
Component address
Alarm id

Screen 5-10. Redefine Severity of Alarms Operation Ring Menu and Report

You have four operation function choices while working in this ring menu: add, change, delete, and verify. You also can choose to get help if you want it.

If you want to change a severity redefinition, go to Procedure 5-7.

If you want to delete a severity redefinition, go to Procedure 5-8.

If you want to verify a severity redefinition, go to Procedure 5-9.

Continue this procedure to *add* a record that redefines the severity of an alarm:

3. At the Redefine Severity of Alarms Ring Menu, press keyboard space bar to move the highlight bar to the Add field of the Operation Ring Menu (or press **a**), and press .
4. The ring menu portion of the screen and the template change according to your selection. The following screen appears if you selected to Add a record to redefine the severity of an alarm.

[ADD SEVERITY]		HELP=<ctrl-o>
Type Ctrl-G to add this severity to the database; DEL to return to the menu		
Severity level		<i>Enter CR, MA, MI, or IN</i>
NMS address	ANY	<i>Enter NMS address of module generating alarm</i>
Node address	ANY	<i>Enter node address of module generating alarm</i>
Component address	ANY	<i>Enter component address of module generating alarm</i>
Alarm id	ANY	<i>Enter alarm id number</i>
** One-line help message appears here **		

Screen 5-11. Add Alarm Severity Record

5. The first field is for the severity level. Enter the severity level (CR, MA, MI, or IN) that you want the alarm(s) to have from now on.
6. Press to finish the entry and proceed to the next field. Each subsequent field is then entered. Note that the remaining fields have the default **ANY**, which you can choose by pressing . Also note that the help line (line 23 on the screen) changes for each field to assist you in making the entry. The help line for each entry is reproduced in the screen above using italics.

If you wish to quit the session without having the entries take effect, press . You are returned to the second (Operations) Ring Menu.
7. When you are finished with your entries, press **g** to add this record to the database. You are then at the first entry in the next Add Severity operation.
8. When you are finished adding alarm severities (the last **g**), press to return to the second (Operations) Ring Menu.
9. **z** will exit the application at any point.

Defining Alarm Thresholds

Setting thresholds allows you to suppress alarms according to the frequency with which the alarms are received. Either of two types of thresholds can be specified: *absolute thresholding*, or *modulo thresholding*. The thresholds are applied to alarms arriving during a *threshold interval*. However, either type of threshold is not applied during the startup of an alarm list. All outstanding alarms of the severity requested are shown.

Thresholding applies to all alarm display processes and external systems. Thresholding is applied *before* any filter criteria are applied.

With *absolute thresholding*, alarms are suppressed until the alarms count equals the established threshold value during the interval. Once this value is reached, the current alarm as well as all subsequent alarms are displayed as usual, until the threshold interval is over. Once the threshold interval is over, alarms are once again suppressed until the alarms count equals the established threshold value. The alarm count is restarted with the first alarm that occurs after the threshold interval is over.

As an example, for a given alarm, if you specify an absolute threshold of five, and a threshold interval of one hour, you will not see an occurrence of the alarm until it is received for the fifth time in the hour. You will see all subsequent occurrences of the alarm (6th, 7th, 8th, and so forth) until the threshold interval expires. The next occurrence of the alarm resets the count to one, and counting continues again for the next hour. If the hour started at noon and four alarms arrived by 1:00 p.m., all four alarms would be suppressed. If another alarm arrived at 1:10 p.m., it would be considered the first alarm in that new hour interval. If six more alarms arrived before 2:10 p.m., the fifth, sixth, and seventh would not be suppressed.

With *modulo thresholding*, alarms are suppressed until the alarms count equals the established threshold value during the interval. Once this value is reached, the current alarm is displayed. Subsequent alarms are not displayed until the threshold value is again reached in that interval. Once the threshold interval is over, alarms are once again suppressed until the alarms count equals the established threshold value. The alarm count is restarted with the first alarm that occurs after the threshold interval is over.

As an example, for a given alarm, if you specify a modulo threshold of five, and a threshold interval of one hour, you will not see an occurrence of the alarm until it is received for the fifth time if all five occurred in the same hour. You will see each fifth occurrence of the alarm (5th, 10th, 15th, 20th, and so forth) until the threshold interval expires. The next occurrence of the alarm resets the count to one, and counting continues again for the next hour. If the hour started at noon and four alarms arrived by 1:00 p.m., all four alarms would be suppressed. If another alarm came in at 1:15 p.m., the count would restart for the next hour. If nine more alarms arrived before 2:15 p.m., the fifth and tenth would not be suppressed; the other eight alarms would be suppressed.

Thresholding can be implemented for a set of alarms or a single alarm. For example, if you know that many alarms of the same id are generated by one particular module, you can apply thresholding to alter the number of times the alarm is transmitted, and thereby eliminate unnecessary traffic. If you choose a set of alarms, any alarm in the set increments the count.

As soon as a threshold record is entered into the alarm database, the threshold takes effect for all processes. Use the procedure below to add, change, delete, or verify alarm thresholds. When verifying threshold data, do not use wild cards in the Alarm threshold field. This field is for numeric values (digits) only.

Refer to Procedure 5-5 to redefine the threshold of an alarm.

Procedure 5-5. How to Define (Redefine) the Threshold of an Alarm

1. Perform the Steps of Procedure 5-2, choosing Threshold in Step 4.
2. The Redefine Threshold of Alarms Operation Ring Menu and template appears; it appears as follows:

REDEFINE THRESHOLD OF ALARMS: Add Change Delete Verify Help							
** One-line help message appears here **							
Threshold type	[	]					
Alarm threshold	[	]					
Time interval	[	]hrs	[	]mins	[	]secs	min 30 sec
max 24 hrs							
NMS address	[			]			
Node address	[				]		
Component address	[					]	
Alarm id	[			]			

Screen 5-12. Define Threshold of Alarms Operation Ring Menu and Record

You have four operation choices while working in this ring menu: add, change, delete, and verify. You also can choose to get help if you want it.

If you want to change an alarm threshold, go to Procedure 5-7.

If you want to delete an alarm threshold, go to Procedure 5-8.

If you want to verify an alarm threshold, go to Procedure 5-9.

Continue this procedure to *add* an alarm threshold record:

3. At the Redefine Threshold of Alarms Ring Menu, press keyboard space bar to move the highlight bar to the Add field of the Operation Ring Menu (or type **a**), and press .
4. The ring menu portion and the template change according to your selection. The following screen appears if you selected to Add an alarm threshold record.

⇒ NOTE:

When adding a threshold record, duplicate records are not allowed.

```

[ ADD THRESHOLD ]                                HELP=<ctrl-o>
Type Ctrl-G to add this threshold to the database; DEL to return to the menu
-----
Threshold type      ABS      Enter alarm threshold type (ABSolute or MODulo)
Alarm threshold     Enter alarm threshold (2-999)
Time Interval       hh mm ss Enter timing interval
NMS address         ANY      Enter NMS address of module generating alarm
Node address        ANY      Enter node address of module generating alarm
Component address   ANY      Enter component address of module generating alarm
Alarm id            ANY      Enter alarm id number
-----
** One-line help message appears here **

```

Screen 5-13. Add Threshold Record

5. The first field is for the threshold type. Enter ABS (for absolute) or MOD (for Modulo). Press to finish the entry and proceed to the next field.
6. The second field is for the alarm threshold. Enter the threshold (a number from 2-999). Do not enter wild cards in this field.
7. Press to finish the entry and proceed to the next field. Each subsequent field is then entered. Note that most of the remaining fields have the default **ANY**, which you can choose by pressing . Also note that the help line (line 23 on the screen) changes for each field to assist you in making the entry. The help line for each entry is reproduced in the screen above using italics.

If you wish to quit the session without having the entries take effect, press . You are returned to the second (Operations) Ring Menu.
8. When you are finished with your entries, press **g** to add this record to the database. This action also brings you to the first entry in the next Add Threshold operation.
9. When you are finished adding threshold records (the last **g**), press to return to the second (Operations) Ring Menu.

⇒ NOTE:

z will exit the threshold application at any point.

Redefining Alarm Text

Text Redefinition applies to configurations where the alarms are being sent to an external system (such as ACCUMASTER Integrator) only, since this feature relies on the xport process. See the subsections **Exporting Alarms** and **Master Alarm Collection**. The text field of alarm messages may be redefined by the xport process before being transmitted to the target system.

Text Redefinition is ideally used in configurations in which alarms are forwarded to other network management systems, where *StarKeeper II* NMS alarm formats may not be appropriate or familiar to end users. The format of these alarms can be redefined to conform to local standards.

The TF1 record provided with *StarKeeper II* NMS, may be edited by using the Change option of Alarm Text Redefinition. This will allow you to customize the text of alarms that are sent to other systems. Note that *StarKeeper II* NMS systems cannot be subordinate systems (that is, cannot send alarms) to any other *StarKeeper II* NMS system that you may be using, regardless of generic. In addition, a *StarKeeper II* NMS system cannot be subordinate to other *StarKeeper II* NMS systems. Thus, a *StarKeeper II* NMS cannot xport alarms to any other *StarKeeper II* NMS.

This implies that a receiving system will have to establish connections with your sending *StarKeeper II* NMS and invoke the xport command with the TF1 text redefinition record. It is possible to define new records as well. If you do, the record name must be specified on the invocation line for the xport command. This means that the name and contents of the text redefinition record must be coordinated with the administrator of the receiving system.

If it becomes necessary to change the text redefinition specification after the corresponding **xport** process has started, it will be necessary to terminate the **xport** process and restart it so it can pick up the specification.

Refer to Procedure 5-6 to add a text redefinition record for an alarm.

Procedure 5-6. How to Redefine the Text of an Alarm

1. Perform the Steps of Procedure 5-2, choosing Redefine_text in Step 4.
2. The Redefine Text of Alarms Operation Ring Menu and template appears; it appears as follows:

```
REDEFINE TEXT OF ALARMS: Add Change Delete Verify Help
** One line help message appears here **
```

```
Text name
NMS address
Node address
Component address
Alarm id
Redefined text
```

Screen 5-14. Redefine Text of Alarms Operation Ring Menu and Record

You have four operation choices while working in this ring menu: add, change, delete and verify. You also can choose to get help if you want it.

If you want to change text redefinition, go to Procedure 5-7.

If you want to delete text redefinition, go to Procedure 5-8.

If you want to verify text redefinition, go to Procedure 5-9.

To continue this procedure, assume you want to *add* text redefinition information.

3. At the Redefine Text of Alarms Ring Menu, press keyboard space bar to move the highlight bar to the Add field of the Operation Ring Menu (or type a) and press .
4. The ring portion of the screen and the template change according to your selection. The following screen appears if you selected to add a text redefinition record.

```

[ ADD TEXT ]                                HELP=<ctrl-o>
Type Ctrl-G to add this text to the database; DEL to return to the menu

Text name                                     Enter the name/id of the new text
NMS address      ANY      Enter NMS address of module generating alarm
Node address     ANY      Enter node address of module generating alarm
Component address ANY      Enter component address of module generating alarm
Alarm id         ANY      Enter alarm id number
Redefined text                               Enter new text for alarm

** One-line help message appears here **
```

Screen 5-15. Add Text Redefinition Record

5. The first field is for the text name (or id). Enter the name of the record for redefining text. We recommend you specify **TF1** since it is already available.

 CAUTION:

Do not, under any circumstances, remove or rename the TF1 file. It is easiest to just add new records to this file.

6. Press to finish the entry and proceed to the next field. Each subsequent field is then entered. Note that the help line (line 23 on the screen) changes for each field to assist you in making the entry. The help line, for each entry, is reproduced in the Screen above using italics. Also, refer to the next subsection, titled **Redefining Text Using Field Identifiers** for instructions in completing the "Redefined text" entry in the template.

If you want to quit the session without having the entries take effect, press . You are returned to the second (Operations) Ring Menu.

7. When you are finished with your entries, press **g** to add this record to the database. This action also brings you to the first entry in the next Add Text operation.
8. When you are finished adding redefined text records (the last **g**), press to return to the second (Operations) Ring Menu.

 NOTE:

z will exit the application at any point.

Redefining Text Using Field Identifiers

Text is redefined using ten field identifiers, {1} through {10}, which are explained below. When the text is redefined, the field identifiers are replaced by the corresponding field values from the original alarm message. An example follows the field identifier definitions.

Field	Explanation	Field ID
NMS_TYPE	The type of network management system that generated the alarm (for example, SK or PARADYNE) (8 byte maximum). This field has no subfields.	{1}
NMS_ADDR	The address of the NMS that generated the alarm (18 byte maximum). This field has no subfields.	{2}
MESSAGE ID	For <i>StarKeeper</i> II NMS, this is the alarm ID (e.g, 1010 or 18027); for PARADYNE, this is the fault type (for example, FA, NR, and so forth) (10 byte maximum). This field has no subfields.	{3}
MODTYPE	The type of module or device reporting the alarm to <i>StarKeeper</i> II NMS (for example, TY12, CPM) or reporting the fault to PARADYNE (for example, APL, DDS, DDD) (8 byte maximum). This field has no subfields.	{4}
DATE_STAMP	The date stamp created by the sending <i>StarKeeper</i> II NMS. Appears in / mm/dd/yyyy format (11 bytes fixed). First level subfields are allowed in the range [5.1] to [5.3], which represent the month, day, and year.	{5}
TIME_STAMP	The time stamp created by the sending <i>StarKeeper</i> II NMS. Appears in hh:mm:ss format (9 bytes fixed). First level subfields are allowed in the range [6.1] to [6.3], which represent the hour, minute, and second.	{6}
MSG_TEXT	The original text of the alarm (200 byte maximum). This field has no subfields.	{7}
SEVERITY	The severity level of the alarm (for example, *C, **, *_ , and __). If the -e option is specified in the call setup file (see "The xport Process"), the words CRITICAL, MAJOR, MINOR, and INFORMATIONAL are used instead of the symbols *C, **, *_ , and __, respectively. Alarms of severities other than the four listed above will remain untouched (3 byte maximum). This field has no subfields.	{8}
NET_ADDR	The network address of the network component that generated the alarm (40 byte maximum). First level subfield addressing is allowed for this identifier (for example, [9.1], [9.2], and so forth); these subfields represent the different levels of addressing (for example, node id, cabinet number, shelf number, slot number, and so forth) The ! character is used as the first level subfield separator.	{9}
ALARM STATUS	The status of the alarm message (for example, active or cleared) (2 byte maximum). This field has no subfields.	{10}

Below is a sample entry of an Add Text Redefinition Record.

[ADD TEXT]	
Type Ctrl-G to add this text to the database; DEL to return to the menu	
Text name	[TMP]
NMS address	[star1]
Node address	[west/garden/silver]
Component address	[5.4]
Alarm id	[18027]
Redefined text	[Alarm {3} of severity {8} occurred on]
	[{4} at node address {9}]
	[{5} {6}]

Screen 5-16. Sample Add Text Redefinition Record

Changing Alarm Conditioning Records

To change alarm conditioning records, you must access the proper ring menus and record forms (see Procedure 5-2); then follow the steps in Procedure 5-7.

Observe the help messages (lines 2 and 23) on the forms as you search for records and make changes; they will assist you each step of the way. Help also is available by pressing **o**.

Procedure 5-7. How to Change an Alarm Conditioning Record

1. Perform Procedure 5-2, choosing the alarm conditioning feature you want to change—Filter, Severity, Threshold, or Redefine_text.
2. At the second (Operation) Ring Menu, press keyboard space bar to move the highlight bar to the **Change** field, and press , or type **c**.
3. The applicable form appears and the program asks you to enter search criteria to identify the alarm conditioning feature record to be changed.
4. Identify the records to be changed.

Refer to Screen 5-9 for the Filter Record.

Refer to Screen 5-11 for the Alarm Severity Record.

Refer to Screen 5-13 for the Alarm Threshold Record.

Refer to Screen 5-15 for the Alarm Text Redefinition Record.

You can enter data (search criteria) in any field. For example, to search for the records on the node address (for the selected alarm conditioning feature), position the cursor on the **Node address** field and enter ***national/west/garden/**** to specify all records for the national/west/garden (network/area/exchange).

On some field entries, default choices are available, especially the **ANY** entry. Using **ANY** in a field places no search restrictions for that field.

Make no entries to choose all records.

5. When you finish entering the search criteria, press **g**. This action starts a search process for all records that match the search criteria. Whenever your search criteria could retrieve more than one specific record, you will have to navigate among the set of records to choose the record(s) you wish to change.
6. The screen displays the alarm conditioning form for the first record. At the top of the record is the Change Ring Menu, which looks like this:

CHANGE:

Screen 5-17. The Change Ring Menu

7. Choose the record you want to display (and then change), as explained below.

Change_this record	to change the currently-displayed record.
Next	to display the next record on the screen.
Previous	to return to view the previously-displayed record.
Jump	to go directly to the record number that you specify.
First	to return to the first record.
Last	to display the last record on the screen.
Help	screen help on the application or use of special keys.

8. When the screen displays the record you want to change, choose **Change this record** from the Change Ring Menu.
9. Press to skip from field to field until you get to the field you want to change. Type the new or corrected data into the appropriate field.
10. When you finish changing data on the record, press **g**. This action starts a verification process to assure all your entries are valid. If they are, the data is changed in the configuration database; if not, you are prompted to correct your entry.

You are prompted to confirm your change (**y** or **n**).

11. When the change is entered into the database, you are returned to the Change Ring Menu. There you can choose to change another record by repeating this procedure.

12. When you finish making changes to the chosen alarm conditioning feature, press at the Change Ring Menu to return to Operations Ring Menu. There you can choose to do a different operation on the same type of alarm conditioning feature previously chosen on the Alarm Conditioning Ring Menu.
13. When you finish with the Operations Ring Menu, press to return to the Alarm Conditioning Ring Menu. There you can choose a different alarm conditioning feature to change.
14. When you finish with the Alarm Conditioning Ring Menu, press . This will bring a confirmation ring menu to the screen; choose "yes" and exit to the shell.



NOTE:

z will exit the alarm conditioning feature at any point.

Deleting Alarm Conditioning Records

To delete alarm conditioning records, you must access the proper ring menus and record forms (see Procedure 5-2); then follow the steps in Procedure 5-8.

Observe the help messages (lines 2 and 23) on the forms as you search for records and make deletions; they will assist you each step of the way. Help also is available by pressing **o**.

Procedure 5-8. How to Delete an Alarm Conditioning Record

1. Perform Procedure 5-2, choosing the alarm conditioning feature you want to delete—Filter, Severity, Threshold, or Redefine_text.
2. At the second (Operation) Ring Menu, press keyboard space bar to move the highlight bar to the **Delete** field, and press , or type **d**.
3. The applicable form appears and the program asks you to enter search criteria to identify the alarm conditioning feature record to be deleted.
4. Identify the records to be changed.

Refer to Screen 5-9 for the Filter Record.

Refer to Screen 5-11 for the Alarm Severity Record.

Refer to Screen 5-13 for the Alarm Threshold Record.

Refer to Screen 5-15 for the Alarm Text Redefinition Record.

You can enter data (search criteria) in any field. For example, to search for the records on the node address (for the selected alarm conditioning feature), position the cursor on the **Node address** field and enter ***national/west/garden/**** to specify all records for the national/west/garden (network/area/exchange).

On some field entries, default choices are available, especially the **ANY** entry. Using **ANY** in a field places no search restrictions for that field.

Leave the form blank to choose all records.

5. When you finish entering the search criteria, press **g**. This action starts a search process for all records that match the search criteria. Whenever your search criteria could retrieve more than one specific record, you will have to navigate among the set of records to choose the record(s) you wish to change.
6. The screen displays the alarm conditioning form for the first record. At the top of the record is the Delete Ring Menu, which looks like this:

DELETE: Delete_this_record Next Previous Jump First Last Help

Screen 5-18. The Verify Ring Menu

7. Choose the record you want to display (and then delete), as explained below.

Delete_this_record	to delete the currently-displayed record.
Next	to display the next record on the screen.
Previous	to return to view the previously-displayed record.
Jump	to go directly to the record number that you specify.
First	to return to the first record.
Last	to display the last record on the screen.
Help	screen help on the application or use of special keys.

8. When the screen displays the record you want to delete, choose `Delete_this_record` from the Delete Ring Menu. This action displays a Confirm Ring Menu.
9. Choose **y** or **n** to confirm your choice.
10. When the record deletion is entered into the database, you are returned to the Delete Ring Menu. There you can choose to delete another record by repeating this procedure.
11. When you finish deleting records of the chosen alarm conditioning feature, press at the Delete Ring Menu to return to Operations Ring Menu. There you can choose to do a different operation on the same type of alarm conditioning feature previously chosen on the Alarm Conditioning Ring Menu.
12. When you finish with the Operations Ring Menu, press to return to the Alarm Conditioning Ring Menu. There you can choose a different alarm conditioning feature to add/change/delete/verify.

13. When you finish with the Alarm Conditioning Ring Menu, press . This will bring a confirmation ring menu to the screen; choose "yes" and exit to the shell.

**NOTE:**

z will exit the alarm conditioning feature at any point.

Verifying Alarm Conditioning Records

To verify alarm conditioning records, you must access the proper ring menus and record forms (see Procedure 5-2); then follow the steps in Procedure 5-9.

Observe the help messages (lines 2 and 23) on the forms as you search for records to verify; they will assist you each step of the way. Help also is available by pressing **o**.

Procedure 5-9. How to Verify an Alarm Conditioning Record

1. Perform Procedure 5-2, choosing the alarm conditioning feature you want to verify—Filter, Severity, Threshold, or Redefine_text.
2. At the second (Operation) Ring Menu, press keyboard space bar to move the highlight bar to the **Verify** field, and press , or type **v**.
3. The applicable form appears and the program asks you to enter search criteria to identify the alarm conditioning feature records to be verified.
4. Identify the records to be changed.

Refer to Screen 5-9 for the Filter Record.

Refer to Screen 5-11 for the Alarm Severity Record.

Refer to Screen 5-13 for the Alarm Threshold Record.

Refer to Screen 5-15 for the Alarm Text Redefinition Record.

You can enter data (search criteria) in any field. For example, to search for the records on the node address (for the selected alarm conditioning feature), position the cursor on the **Node address** field and enter ***national/west/garden/**** to specify all records for the national/west/garden (network/area/exchange).

On some field entries, default choices are available, especially the **ANY** entry. Using **ANY** in a field places no search restrictions for that field.

Leave the form blank to choose all records.

5. When you finish entering the search criteria, press **g**. This action starts a search process for all records that match the search criteria. Whenever your search criteria could retrieve more than one specific record, you will have to navigate among the set of records to choose the record(s) you wish to change.

6. The screen displays the alarm conditioning form for the first record. At the top of the record is the Verify Ring Menu, which looks like this:

VERIFY: Next Previous Jump First Last Help

Screen 5-19. The Verify Ring Menu

7. Choose the record you want to display, as explained below.

Next	to display the next record on the screen.
Previous	to return to view the previously-displayed record.
Jump	to go directly to the record number that you specify.
First	to return to the first record.
Last	to display the last record on the screen.
Help	screen help on the application or use of special keys.

8. When you finish verifying records, press at the Verify Ring Menu to return to Operations Ring Menu. There you can choose to do a different operation (add /change/delete/verify) on the same type of alarm conditioning feature previously chosen on the Alarm Conditioning Ring Menu.
9. When you finish with the Operations Ring Menu, press to return to the Alarm Conditioning Ring Menu. There you can choose a different alarm conditioning feature.
10. When you finish with the Alarm Conditioning Ring Menu, press . This will bring a confirmation ring menu to the screen; choose "yes" and exit to the shell.



NOTE:

z will exit the alarm conditioning feature at any point.

Master Alarm Collection

The *StarKeeper* II NMS host computer can act as a Master Alarm Collector (MAC) collecting alarms from subordinate *StarKeeper* NMS hosts. Alarms are forwarded from the subordinate NMS to the MAC. This relationship of Master/Subordinate is configured with the **cf** commands (see **Chapter 4**) when the alarm connection is configured and made active.

⇒ NOTE:

StarKeeper II NMS can be a MAC; however, it cannot be a subordinate NMS. the distinction between *StarKeeper* II NMS and *StarKeeper* NMS is intentional. *StarKeeper* NMS is the subordinate.

When alarms are cleared at the remote *StarKeeper* NMS, they will be cleared at the MAC. The MAC can monitor its own *StarKeeper* II NMS domain as well as consolidate alarms from remote locations.

Exporting Alarms

StarKeeper NMS or *StarKeeper* II NMS can forward alarm data to a target system. The xport process is responsible for sending alarms to an external system. An external system is a system other than *StarKeeper* NMS or *StarKeeper* II NMS, such as ACCUMASTER Integrator. Exporting alarms also accepts filter specifications and text redefinition, so that you can choose a subset of alarms to be displayed on the target system as well as redefine the text of these alarm messages.

⇒ NOTE:

Do not alter any alarm export options or call setup scripts. If the default NF1/PF1/TF1 tables are used, and new record information is added, the xport and call setup files will never have to be changed. If call setup scripts or options to xport are changed, the system will behave unpredictably and it will be difficult to troubleshoot the problem. The xport process starts automatically and never has to be altered if the NF1 and PF1 default settings are used. The xport process must be terminated when adding new records to TF1.

The receiving external system will establish connections with the sending *StarKeeper* NMS or *StarKeeper* II NMS and will invoke the xport command.

Importing Alarms

StarKeeper II NMS can collect alarms data imported from a specified subordinate *StarKeeper* NMS.

To terminate import: On the MAC, inactivate the connection to the subordinate *StarKeeper* NMS using the **cfchange** command. To reactivate import: On the MAC, use the **cfchange** command to activate the connection to the subordinate *StarKeeper* NMS.

Alarm Conditioning for MAC Configurations

Alarms from multiple *StarKeeper* NMSs can be consolidated onto a single *StarKeeper* II NMS. In this case, the multiple *StarKeeper* NMSs are referred to as Subordinate *StarKeeper* NMSs, while the single, target *StarKeeper* II NMS is designated as the Master or Master Alarm Collector (MAC). *StarKeeper* II NMS can be a master but not a subordinate.

Keep the following points in mind when conditioning alarms with a Master/Subordinate configuration:

Filters

- If you are using existing NF1/PF1 filters, alarms are automatically filtered and no restart of xport is necessary.



CAUTION:

Do not remove the default filters PF1/NF1. Use the PF1/NF1 filter and add new records, if needed, or change the criteria if you also want to see minor or informational alarms. Use caution! This action could flood the Master Alarm Collector with unnecessary alarms.

- If you are not using the existing NF1/PF1 filters, then create the Filter Record on the Subordinate *StarKeeper* NMS.
- Specify the Filter ID in the SK-NMS or SK-NMS4 call setup file on the Master *StarKeeper* II NMS if NF1/PF1 are not used; otherwise, no connection to the subordinate *StarKeeper* NMS can be established. Terminate the xport process or restart *StarKeeper* II NMS.
- Make sure all sending systems have the same Filter ID as in the call setup file on the receiving system. Restart the *StarKeeper* II NMS.
- You can create filters on a MAC for its own alarms. This filter could be used in the **netdisp** and **alarms** commands. It would not require that xport be terminated.

*Severity
Redefinition*

- For alarms coming from a subordinate to have their severities redefined before the alarm reaches the MAC, create the severity record on the subordinate *StarKeeper* NMS.
- For the Severity Redefinition to be set on the MAC, create the record on the MAC.
- The Severity Redefinition record is not specified in the call setup file; there is no need to terminate xport; additions, changes, and deletions take effect immediately.

Thresholding

- For the threshold to be set on the Master *StarKeeper* II NMS only, create the Threshold Redefinition record on the Master *StarKeeper* II NMS.
- The threshold record is not specified in the call setup file; there is no need to terminate xport; additions, changes, and deletions take effect immediately.

*Text
Redefinition*

Text redefinition is ideally used in configurations in which alarms are forwarded to other Network Management Systems where *StarKeeper* II NMS alarm formats may not be appropriate or familiar to end users.

- Text redefinition is only done on the sending NMS.
- Use the default record TF1, and add Text Redefinition records to it. Do not delete TF1. (See the guidelines previously mentioned for *Filters*.)
- If you do not want to use the default TF1 record, create a new Text Redefinition record on the sending NMS.
- Specify the text redefinition ID in the call setup file on the receiving system.
- Make sure all sending systems have the same text redefinition ID as in the call setup file on the receiving system.
- If you have changed the TF1 ID, wish to use a new Text Redefinition record, or wish to terminate the use of a Text Redefinition record, you must terminate the xport process for any additions, changes, or deletions of records to take place.

Graphical Displays

Extensive graphical displays, including area maps and node shelf/module representations, are available using the Network Monitor application included with the graphics system software.

Network Monitor

The Network Monitor application is a sophisticated fault management package that provides user-friendly, menu-based access to alarm handling and diagnostics capabilities from a central location. Network Monitor provides task-oriented windows into your network. These windows provide simultaneous access to network maps showing the status of the network, alarm lists with detailed information about *outstanding* alarms, diagnostics commands and other alarm-related commands, and configuration information. The features of Network Monitor application fall into one of these four broad categories: interactive bit-mapped graphical displays, interactive lists of alarm textual information, centralized alarm monitoring, and fault diagnosing

Refer to the *StarKeeper II NMS Graphics System Guide* for more information.

Log Files

StarKeeper II NMS generates five log files to monitor network activities and to help anticipate the needs of your network. The five log files are:

CONSLOG	tracks all the network commands entered on the system (using pass-through), where they were entered, and their destination.
EVENTLOG	tracks only <i>StarKeeper II</i> NMS alarms and messages, such as informational messages that tell which processes are running and which are not. The EVENTLOG does not track node alarms.
MSGLOG	tracks the console output (such as alarm messages) from each node in the network.
SMLOG	tracks the Session Maintenance output of the smstat and smverify command from each node in the network.
ADMINLOG	tracks the output of the smdsmeas command from each node in the network.

When pass-through commands are executed from a Core System or remotely from a Graphics System, a log file is automatically created.

Refer to the following subsections for instructions on accessing log files.

Reading Console Log Files

Follow the instructions in the procedure below to access Console Log Files.

Procedure 5-10. How to Access Console Log Files

1. Change directories to the Console Log File by using the OS **cd** command with the substitute character **\$**. Enter: **cd \$CONSLOG**.
2. Use the OS **ls** command to get a list of files available and use the options to request a long list arranged chronologically with the latest on top, enter: **ls -lt**. You will see a listing such as the one shown in the following screen:

```
total 1661
-rw-r--r--  1  CNMS  sk    67602  Jan   7  15:58  980107.3
-rw-r--r--  1  CNMS  sk   208802  Jan   7  15:33  980107.2
-rw-r--r--  1  CNMS  sk   102514  Jan   7  10:57  980107.1
-rw-r--r--  1  CNMS  sk   105656  Jan   6  00:02  980106.2
-rw-r--r--  1  CNMS  sk   201206  Jan   6  13:37  980106.1
```

Screen 5-20. Listing of Files in a Console Log Directory

The Console Log File names reveal when they were written. For example, **980107.3** is in YYMMDD.sequence format. Therefore, the top entry ("980107.3") in the listing above, was written in 1998 on January 7; it was the third log file written that day.

3. Select the Console Log File you want to view and bring it to the screen using the OS **pg** command. For example: **pg 980107.3**. To view the file, page by page, press . To quit the file at any time, press . A sample portion of a Console Log File is shown in the following screen.

```
##
15:33  1  FROM:cnmsadm    TO:garden/silverB
verify sam board 17 +

      15:33  14      FROM:garden/silverB      TO:cnmsadm
98-01-01 10:49:18 NODE=SILVER
M verify sam board 17 1-2
MODULE ADDRESS: 17
MODULE TYPE: sam (2-board)          NCHLS:72
SERVICE STATE: in
TRUNK TYPE: samsl
TOTAL BOARDS: 2
DOWNLOAD SERVER: controller        VERSION: standard

BOARD      SERVICE      SOFTWARE
ADDR      STATE      VERSION
  1         in      standard
  2         in      standard
```

Screen 5-21. Sample CONSLOG File

Reading Event Log Files

Follow the instructions in the following procedure to access Event Log Files.

Procedure 5-11. How to Access Event Log Files

1. Change directories to the Event Log File by using the OS **cd** command with the substitute character **\$**. Enter: **cd \$EVENTLOG**.
2. Use the OS **ls** command to get a list of files available and use the options to request a long list arranged chronologically with the latest on top, enter: **ls -lt**. You will see a listing such as the one shown in the following screen:

```
total 1661
-rw-r--r--  1  CNMS  sk    67602  Jan   7  15:58  980107.3
-rw-r--r--  1  CNMS  sk   208802  Jan   7  15:33  980107.2
-rw-r--r--  1  CNMS  sk   102514  Jan   7  10:57  980107.1
-rw-r--r--  1  CNMS  sk   105656  Jan   6   00:02  980106.2
-rw-r--r--  1  CNMS  sk    201206 Jan   6  13:37  980106.1
```

Screen 5-22. Listing of Files in an Event Log Directory

The log file names reveal when they were written. For example, **980107.3** is in YYMMDD.sequence format. Therefore, the top entry ("980107.3") in the listing above, was written in 1998 on January 7; it was the third log file written that day.

3. Select the Event log file you want to view and bring it to the screen using the OS **pg** command. For example: **pg 980107.3**. To view the file, page by page, press . To quit the file at any time, press **q**. A sample portion of an Event Log File is shown in the following screen.

```
11:07
10001 REPORT CNMSMSG monitor: StarKeeper NMS startup. Monitor (20861) invoked.
##
11:07
##
10031 REPORT CNMSMSG monitor: Process elogger (20864) started.
##
11:07
##
10031 REPORT CNMSMSG monitor: Process parse (20865) started.
##
```

Screen 5-23. Sample EVENTLOG File

Reading Message Log Files

Follow the instructions in the following procedure to access Message Log Files.

Procedure 5-12. How to Access Message Log Files

1. Change directories to the Message Logs by using the OS **cd** command with the substitute character **\$**. Enter: **cd \$MSGLOG**.
2. Use the OS **ls** command to get a list of subdirectories. Each node has its own subdirectory for Message Log Files; enter: **ls**. You will see a listing such as the one shown in the following screen:

```
silver
gold
platinum
sknodea
node1
node20
```

Screen 5-24. Listing of Subdirectories in a Message Log Directory

The Message log files are stored in a hierarchical arrangement; for example, node silver has its Message Log files under *\$MSGLOG/silver*.

3. Change directories to the desired node Message Logs by using the OS **cd** command. For example, enter: **cd \$MSGLOG/silver**
4. Use the OS **ls** command to get a list of files available and use the options to request a long list arranged chronologically with the latest on top, enter: **ls -lt**.

You will see a listing such as the one shown in the following screen:

```
total 1661
-rw-r--r--  1  CNMS  sk    67602  Jan   7  15:58  980107.3
-rw-r--r--  1  CNMS  sk   208802  Jan   7  15:33  980107.2
-rw-r--r--  1  CNMS  sk   102514  Jan   7  10:57  980107.1
-rw-r--r--  1  CNMS  sk   105656  Jan   6   00:02  980106.2
-rw-r--r--  1  CNMS  sk    201206  Jan   6  13:37  980106.1
```

Screen 5-25. Listing of Files in a Message Log Directory

➤ NOTE:

The log file names reveal when they were written. For example, **980107.3** is in YYMMDD.sequence format. Therefore, the top entry ("980107.3") in the listing above, was written in 1998 on January 7; it was the third log file written that day.

5. Select the log file you want to view and bring it to the screen using the OS **pg** command. For example: **pg 980107.3**. To view the file, page by page, press . To quit the file at any time, press **q**. A sample portion of a Message Log File is shown in the following screen.

```
12:42
****REST OF MESSAGE****
##
12:45  4
      98-01-01 08:00:30  NODE=SILVER
** 8326 MODADDR=7  MODTYPE=sft
REPORT ERROR:  trunkcsc:  Trunk is dead
##
12:46  6
      98-01-01 08:01:45  NODE=SILVER
** 8456
      REPORT FAILURE:  samterm:  Too Many Invalid Attempts.  Predefined
Destination.  Out of Service or Busy
STATION:  26/1.1
Rec act:  Restore Predefined Destination or Remove Station From Service
```

Screen 5-26. Sample MSLOF File

Refer to **Chapter 7**, the subsection titled **Database Maintenance** in the section called **Periodic Checks** for additional information on maintaining Message Log files.

Reading Session Maintenance Log Files

Follow the instructions in the following procedure to access Session Maintenance Log Files.

Procedure 5-13. How to Access Session Maintenance Log Files

1. Change directories to the Session Maintenance Logs by using the OS **cd** command with the substitute character **\$**. Enter: **cd \$SMLOG**.
2. Use the OS **ls** command to get a list of subdirectories. Each node has its own subdirectory for Session Maintenance Log Files; enter: **ls**. You will see a listing such as the one shown in the following screen:

```
silver
gold
platinum
sknodea
node1
node2
node20
```

Screen 5-27. Listing of Subdirectories in a Session Maintenance Log Directory

3. Change directories to the desired node Session Maintenance Logs by using the OS **cd** command. For example, enter: **cd silver**
4. Use the OS **ls** command to get a list of files available and use the options to request a long list arranged chronologically with the latest on top, enter: **ls -lt**. You will see a listing such as the one shown in the following screen:

```
total 1661
-rw-r--r--  1  CNMS  sk    67602  Jan   7  15:58  980107.3
-rw-r--r--  1  CNMS  sk   208802  Jan   7  15:33  980107.2
-rw-r--r--  1  CNMS  sk   102514  Jan   7  10:57  980107.1
-rw-r--r--  1  CNMS  sk   105656  Jan   6   00:02  980106.2
-rw-r--r--  1  CNMS  sk    201206  Jan   6   13:37  980106.1
```

Screen 5-28. Listing of Files in a Session Maintenance Log Directory



NOTE:

The log file names reveal when they were written. For example, **980107.3** is in YYMMDD.sequence format. Therefore, the top entry ("980107.3") in the listing above, was written in 1998 on January 7; it was the third log file written that day.

- Select the log file you want to view and bring it to the screen using the OS **pg** command. For example: **pg 980107.3**. To view the file, page by page, press **Enter**. To quit the file at any time, press **q**. Screen 5-29 shows a sample log file with data received from a **smstat** command; Screen 5-30 shows a sample log file with data received from a **smverify** command.

```

10:09:44
##
smstat -n silver

98-01-01 10:01:08 NODE= silver
smstat
SERVICE STATE OF SM:  in

MOST RECENT PARTIAL OR COMPLETE REROUTE FAILURE [PRIMARY NODE]
-----
01/01/98 09:32:32
FAILED TRUNK: 8

ASSISTING TRUNK  ASSISTING CS    REASON FOR
ATTEMPTED          ATTEMPTED    FAILURE
6                  2            trunk out of svc on secondary node
10                 16           trunk out of svc on secondary node
10                 3            trunk out of svc on secondary node

MOST RECENT REVERSION FAILURE [PRIMARY NODE]
-----
01/01/98 09:24:58
FAILED TRUNK: 8
REASON FOR FAILURE: reversion request not acknowledged

COMPLETE REROUTE PATHS OF MOST RECENT REROUTE [PRIMARY NODE]
-----

```

FAILED TRUNK	CS	FROM NODE	FROM TRUNK	TO NODE	TO TRUNK	ASSISTING CS
8	1	silver	6	node2	7	2
8	2	silver	10	node1	28	16
		node1	2	node3	5	16
		node3	8	node2	5	2
8	3	silver	10	node1	28	15
		node1	2	node3	5	15
		node3	8	node2	5	3

Screen 5-29. Sample SMLOG File (with smstat messages)


```
13:06:26
##
smverify -n silver -a node2
98-01-01 13:29:17 NODE= silver
smverify
SERVICE STATE OF SM:  in
NEIGHBOR NODE NAME:  node2
NUMBER OF HOPS TO THIS NEIGHBOR:  1
ASSISTING NODE NAME
      copper  node1
TRUNK MODULE ADDRESS
      8      6

13:07:48
##
smverify -n silver -a copper
98-01-01 13:30:36 NODE= silver
smverify
SERVICE STATE OF SM:  in
NEIGHBOR NODE NAME:  copper
NUMBER OF HOPS TO THIS NEIGHBOR:  1
Incomplete neighbor node entry exists for star1.
      No trunks are specified.
ASSISTING NODE NAME
      node1  node2
```

Screen 5-30. Sample SMLOG File with smverify messages

Reading Administration Log Files

Follow the instructions in the following procedure to access Administration Log Files.

Procedure 5-14. How to Access Administration Log Files

1. Change directories to the Administration Logs by using the OS **cd** command with the substitute character **\$**. Enter: **cd \$ADMINLOG**.
2. Use the OS **ls** command to get a list of subdirectories. Each node has its own subdirectory for Administration Log Files; enter: **ls**. You will see a listing such as the one shown in the following screen:

```
silver
gold
platinum
sknodea
node1
node2
node20
```

Screen 5-31. Listing of Subdirectories in an Administration Log Directory

3. Change directories to the desired node Administration Logs by using the OS **cd** command. For example, enter: **cd silver**.
4. Use the OS **ls** command to get a list of files available and use the options to request a long list arranged chronologically with the latest on top, enter: **ls -lt**. You will see a listing such as the one shown in the following screen:

```
total 1661
-rw-r--r--  1  CNMS  sk   167602  Jan   7  15:58  980107.3
-rw-r--r--  1  CNMS  sk    38802  Jan   7  15:33  980107.2
-rw-r--r--  1  CNMS  sk   122514  Jan   7  10:57  980107.1
-rw-r--r--  1  CNMS  sk   102626  Jan   6  00:02  980106.2
-rw-r--r--  1  CNMS  sk    233206  Jan   6  13:37  980106.1
```

Screen 5-32. Listing of Files in an Administration Log Directory

➤ NOTE:

The log file names reveal when they were written. For example, **980107.3** is in YYMMDD.sequence format. Therefore, the top entry ("980107.3") in the listing above, was written in 1998 on January 7; it was the third log file written that day.

5. Select the log file you want to view and bring it to the screen using the OS **pg** command. For example: **pg 980107.3**. To view the file, page by page, press **Enter**. To quit the file at any time, press **q**. Screen 5-31 shows a sample log file with data received from a **smdsmeas** command. Administration Log files are only generated for BNS-2000 AI modules.

```

11:52:16      FROM:cnmsadm      TO:silver
Gathering data, please wait...
SMDS Measurements                      Protocol Error Counts - PDU
Date:  01/01/98 Interval:   11:45 - 11:48
Node:   silver
Module: 9.1                          Module Type: ait1

<-----RECEIVED-L2_PDU----->
INTVL      HCS and PAYLOAD  INVALID      SUM      MID      BOM&SSM      EOM      TOTAL
END  PAYLOAD CRC  LENGTH      SEQ      OF      NOW      INVALID UNAPPRV      VALID
TIME VIOLATIONS  ERROR  NUMBER      ERRORS  ACTIVE      MID      MID      L2_PDUs
11:48              0      0      0      0      0      0  126710  126711

<-----RECEIVED-L3_PDU----->
INTVL      SUM      NUMBER      NUMBER BURST      INVALID      INVALID      INVALID DST ADDR
END      OF      OF DATA      OF BAD ERROR      DEST      SOURCE      SMDS ASSIGNED
TIME  ERRORS      (Ni)      (Nb)  RATIO      ADDR      ADDR      ADDR      TO
              INTERVALS INTERVALS  %      TYPE      TYPE      TYPE SRC  SNI
11:48  126681      38      38  100      0      0      0      0

```

Screen 5-33. Sample ADMIN File

Tracing Calls

StarKeeper II NMS provides a command, **tracec**, that enables you to trace active calls to determine their origin and destination (in a supported network node). To work properly, **tracec** requires that the *StarKeeper II* NMS database was made current, for all nodes it monitors, using **skload** or **cfg_sync**. See **Chapter 4** for complete instructions. The input for this command includes options to specify the endpoint in a network address, and the output is a list of all the modules in the path of the call. Do not attempt to trace calls originating from a fanout TSM8 port, since calls originate from other endpoints; not a fanout. Specify the originating port. Listed below is an abbreviated list of options for **tracec**; run **help** for complete coverage of the **tracec** entry.

- n <nodename> name of the node containing the module for the call to be traced
- m <module#> number of the module for the call to be traced
- p <channel/port#> number of the channel/port for the call to be traced

If you enter **tracec** without options, the system prompts you for the required information. An example entry and resulting screen display are shown in screen 7-34; an illustration of the example traced call is shown in Figure 5-3.

tracec -n west/garden/silver -m 7 -p 224

		BOARD				
NODE	MOD	CH/PT	CU/TM	MODTYPE	GROUP	PKTS

west/garden/silver	7 : 224			cpmhs	group3	3328
west/garden/silver	4	12		trkhs	trk_si	2998
west/garden/gold	6	12		trkhs	trk_gd	3330
west/garden/gold	8	2		cpmhs	acctg	3004

Screen 5-34. An Example of tracec Output Display

On the example trace, a call originates on module 7, channel 224. That module is a cpmhs in group3. The call goes out of node *west/garden/silver* on trunk module 4, channel 12. The trunk is a trkhs module on group *trk_si*. The trunk is connected to node *west/garden/gold* module 6, channel 12. The call terminates on module 8, channel 2. That module is a cpmhs in group *acctg*. The call is illustrated in Figure 5-3.

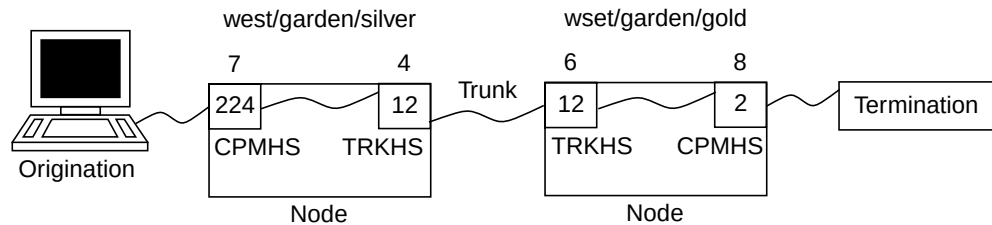


Figure 5-3. Illustrating a Traced Call

The **tracec** command can also trace calls rerouted by the optional node Session Maintenance feature. In those cases, the original path has an asterisk on the nodename and the new path is listed next. An example appears in the screen below, where trunk module 3 on silver was the original path; Session Maintenance rerouted the call to trunk module 4 on silver.

NODE	MOD	CH/PT	BOARD CU/TM	MODTYPE	GROUP
west/garden/silver	6	4		cpmhs	group3
west/garden/silver*	18	131	1/124	trksft	
west/garden/silver+	25	635	5/124	trksft	ggold
west/garden/bronze+	2	?	5/124	trksft	?
west/garden/bronze+	6	?	5/124	trksft	?
west/garden/gold+	8	635	5/124	trksft	gsilver
west/garden/gold	5	62		cpmhs	acctg

* rerouted call

Screen 5-35. An Example tracec Output Display with Session Maintenance

On the example trace, a call originated from *west/garden/silver*, on module 6, port 4, to *west/garden/gold*, on module 5, port 62. The trunk connection was from *west/garden/silver* on module 18. The call was rerouted to *west/garden/silver* on module 25, then to *west/garden/bronze* on module 2, then to *west/garden/bronze* on module 6, and finally back to *west/garden/gold* on module 8.

StarKeeper II NMS collects performance, billing, and alarm data from network elements. These data are then accessed and displayed as readable reports using the **report** command. When the **report** command is entered, messages on the screen request more information. The information requested depends on the data entered to that point; therefore, there is a general procedure on getting reports, followed by a specific procedure for each type of report (*performance*, *billing*, and *alarm*) at the start of each of these sections.

In addition to the **report** command, an optional **smdsmeas** command produces on-demand measurement reports for AI and SMDS trunk modules. The measurement data is retrieved from the node's database as real-time displays. Refer to the BNS-2000 and Data Networking Products manuals for full coverage.

The administrator can add user logins to the *at.allow* file and/or the *cron.allow* files, in the */usr/lib/cron* directory, to allow users to send reports to the printer. As installed, the system allows only the *cnmsadm* login to print reports. Refer to the **at** and **cron** entries in the Operating System (OS) manuals.

Data for reports reside in files (database tables) in the *\$CNMS_DB* directory. Report generation requires configuration tables that were initially populated by the **skload** command and/or maintained with the **cfg_sync** command. Refer to **Chapter 4** for more details.

⇒ NOTE:

The **cfg_sync** command populates certain table information based on ICI information. When **cfg_sync** is executed on a non-primary core machine that is configured in a multicore ICI environment, the core should be connected to the primary core and the primary core should be up and running.

Data in the tables populate the reports. A heading for each report is made from your selections at the **report** command prompts. (Default selections do not appear in the headings.) Report headings on the first page contain a nameplate, report name, the time it was printed, selection criteria, and page number. Each page thereafter does not repeat all of this information.

Procedure 6-1. How to Get Reports (General Procedure)

1. At the SK: prompt, enter **report** (rep, repo, and repor also are acceptable).
To exit the **report** command, at any time, use the Del.
2. You are prompted for the REPORT TYPE. Enter your choice, either **performance** or **billing** or **alarm** (**p**, **b**, and **a** also are acceptable).
3. Screen prompts request additional information, depending on the type of report you requested. Details are in Procedures 6-2, 6-3, and 6-6; run **help** for a full description of the **report** command. Answer each query from the list of available choices.
4. When you answer the final prompt, a message asks if you want the report sent to a printer or to your screen. Answer appropriately; the default is *screen*. The screen responds with a message stating the request is (or is not) being processed.

Performance Reports

The performance subsystem collects, stores, manipulates, and prints performance data generated by the nodes in a network. A description and example of each report are listed in Table 6-1. The table provides a page reference to locate the report. Each report shows an example output, an explanation of the fields in the report, and an interpretation of the report.

Table 6-1. Performance Reports

Name	Report Type	Description	Page
Bisync	Module Performance	Performance data for BSC3270 modules	6-22
	Device Usage	Usage information for BSC3270 modules	6-21
Conc	Concentrator Usage	Concentrator usage and performance	6-24
CPMML	Module Performance	Performance data for CPMML modules	6-25
	Port Performance	Performance data for CPMML ports	6-27
DKAP	Channel Performance	Performance data for DKAP channels	6-28
	Module Performance	Performance data for DKAP modules	6-29
FRM	Module Performance	Performance data for FRM modules	6-30
	Port Performance	Performance data for FRM ports	6-33
	Facility Performance	Performance data for FRM facilities	6-32
	DLCI Utilization	Usage data for FRM DLCIs	6-35
	DLCI Congestion	Congestion data for FRM DLCIs	6-36
FRM-M2	Module Performance	Performance data for FRM-M2 modules	6-37
	Port Performance	Performance data for FRM-M2 physical ports	6-38
	Virtual Port Performance	Performance data for FRM-M2 virtual ports	6-39
	DLCI Utilization	Usage data for FRM-M2 DLCIs	6-41

Table 6-1. Performance Reports —Continued

Name	Report Type	Description	Page
Host SAM	DLCI Congestion	Congestion data for FRM-M2 DLCIs	6-41
	Host Access	Connection data for node receiver groups	6-43
	Multiplexer Module Usage	Usage information for the link to a multiplexer	6-45
	Multiplexer Port Usage	Usage information for ports on modules in a SAM	6-46
Network	Network Availability	Percentage of availability for trunks and nodes	6-48
Node	Node Usage	Summary of group usage on a per node basis	6-50
SAMML	Module Performance	Performance data for SAMML modules	6-51
	Port Performance	Performance data for SAMML ports	6-52
SDLC8	Module Performance	Performance data for SDLC8 modules	6-54
	Port Performance	Performance data for SDLC8 ports	6-56
TRKGRP	Trunk Group Availability	Connection data for trunk groups	6-58
TRUNK	Usage (DDS/64)	DDS/64 trunk usage and performance	6-59
	Usage (non-DDS/64)	Non-DDS/64 trunks usage and performance	6-60
TSM8	Module Performance	Performance data for TSM8 modules	6-62
	Port Performance	Performance data for TSM8 ports	6-64
X.25	Module Performance	Performance data for X.25 modules	6-66
	Host Module Performance (<i>Datakit</i>)	Performance data for X.25 Host modules	6-68
	PDN Usage (<i>Datakit</i>)	X.25 PDN module usage and access	6-67
	X.25Usage	Usage and access data for X.25 modules	6-68
X.75	Module Performance	Performance data for X.75 modules	6-69
	Port Performance	Performance data for X.75 ports	6-70
	Port Utilization	Usage data for X.75 ports	6-72

Performance data for the nodes is specified on *StarKeeper II* NMS via PERFMGMT (see **Chapter 5**) and polled by *StarKeeper II* NMS.

The names of the reports on the node and the corresponding names for the reports as they are on *StarKeeper II* NMS, are a little different. Use Table 6-2 to correlate the reports and to get the name of the database table that is used to generate the report. This table contains the mapping of the node reports to *StarKeeper II* NMS reports. Note that the Network Availability Report is a *StarKeeper II* NMS report only; there is no correlated report on the node.

Table 6-2. Performance Data Reports for BNS-2000 and BNS-2000 VCS Nodes

BNS-2000 and BNS-2000 VCS	<i>StarKeeper II</i> NMS	Table
Bisync concentrator connections	Bisync Module Performance	bsc_mod, bsc_port
	Bisync Device Usage	bsc_port, bsc_term
	Concentrator Usage	rs_sft, rs_swt
	Host Access	p_conct
	Trunk Group Availability	p_conct
CPMML	Node Usage	p_conct
	CPMML Module Performance	cpmml_mod
DKAP	CPMML Port Performance	cpmml_port
	DKAP Module Performance	dkap_mod
FRM	DKAP Channel Performance	dkap_chan
	FRM Module Performance	frm_mod
	FRM Facility Performance	frm_fac
	FRM Port Performance	frm_port
	FRM DLCI Utilization	frm_dlci
FRM-M2	FRM DLCI Congestion	frm_dlci
	FRM-M2 Module Performance	frm_m2_mod
	FRM-M2 Port Performance	frm_m2_pport
	FRM-M2 Virtual Port Performance	frm_m2_vport
	FRM-M2 DLCI Utilization	frm_m2_dlci
SAM	FRM-M2 DLCI Congestion	frm_m2_dlci
	Multiplexer Module Performance	sam_mod, samdl_mod
SAMML	Multiplexer Port Performance	sam_port
	SAMML Module Performance	ml_mod
SDLC8	SAMML Port Performance	ml_port
	SDLC8 Module Performance	sdlc8_mod
trunk	SDLC8 Port Performance	sdlc8_port
	Trunk Usage	trunk, trunk_srf, trunk_std
TSM8	TSM8 Module Performance	tsm8_mod
	TSM8 Port Performance	tsm8_port
X.25	X.25 Module Performance	x25_mod, x25_port
	X.25 Usage	x25_mod, x25_port
X.75	X.75 Module Performance	x75_mod
	X.75 Port Performance	x75_port
	X.75 Port Utilization	x75_port

For instructions on how to view the data retention period and how to set or change it, refer to **Chapter 7**, the table titled **Data Retention and Cleanup Parameters**.

Performance reports for new module types are available from Performance Reporter only.

Performance Reporter

The Performance Reporter application, which is included with the Graphics System software, is a network measurements application that provides user-friendly, menu-based access to performance reports. These performance reports are used to evaluate the performance of network resources—both physical and logical. While *StarKeeper II* NMS does provide basic reporting capabilities, Performance Reporter adds value in terms of a forms-based interface, scheduling capabilities, graphical reports, and other features that are specifically geared to two performance management tasks: Routing Performance Assurance and Long Term Engineering.

Refer to the *StarKeeper II NMS Graphic System Guide* for details.

Getting Performance Reports

The steps for getting performance reports are shown below in Procedure 6-2. If you need more information in order to make an entry, refer to the **Performance Report Entries Description** which follow the procedure.

Procedure 6-2. How to Get Performance Reports

1. At the SK: prompt, enter **report**.
2. You are asked for the REPORT TYPE. Enter **performance** (or just **p**).
3. The screen asks for NODE TYPE. Enter the node type (BNS-2000, BNS-2000 VCS, or network) of switching equipment from which you are gathering performance data. Choose *network* for trunk and node availability reports. If you choose BNS-2000 or BNS-2000 VCS, continue with Step 4; if you choose network, skip to Step 5.
4. The screen asks you for REPORT NAME and presents a list of report types according to how you answered the previous question (on the type of network you have). Choose the report types from the list (see Table 6-1).
5. The screen asks you for a few more lines of data to complete the information required for the selected report. This remaining information gathers names, report intervals, date of report, and similar data for inclusion in the header or body of the report. Answer each line as appropriate; choose defaults if applicable. All of the entries are described in the next heading, **Performance Report Entries Description**.

To exit the session at any time, press **Del**; you are returned to the SK: prompt.

6. When you answer the final prompt, the screen displays a one-line message asking if you want the report sent to a printer or to your screen. Answer appropriately; the default is screen.
7. If you chose to send the report to a printer, the screen responds with a message stating the request is (or is not) being processed, and you are returned to the SK: prompt. If you chose to view the report on the screen, use the to page through the report.

An explanation, an example, and interpretation guidelines appear later in this section for each type of performance report. To save space in this document, in some cases, the headings are slightly altered. Refer to the paragraph heading for the applicable report.

In the reports, a string of asterisks represents a value too large to display in that field. *N/A* also means data are not available for that field.

Performance Report Entries Description

All entry prompts are described below; in actual usage you only encounter those that are applicable to your choices.

- **NODE TYPE** - either *BNS-2000*, *BNS-2000 VCS (DKII)*, or *network*.
- **REPORT NAME** - Specifies the type of performance report being requested (see Table 6-1).
- **SUMMARY PERIOD** - The time interval to be covered by the report: daily, weekly, or monthly. Choosing *weekly*, or *monthly* produces the following prompt/entry.
- **BEGINNING DATE OF SUMMARY PERIOD** - The beginning date is that date from which the report is to start. The default date for performance reports is explicitly given: Sunday of the previous week, for weekly reports, or the first day of the previous month for monthly reports.
- **DATE OF REPORT** - This entry is for daily reports only; the default is yesterday's date. The date is printed as part of the report heading.
- **NODE NAMES** - List of node names as used by *StarKeeper II* NMS, (at most 5), separated by commas, to restrict the set of nodes included in the report. Choosing the default *all* places no limiting factor on the report according to nodes. The system verifies the nodes you specify before proceeding. The system also recognizes address expansion of node names; for example, *silver* is understood to mean *national/west/garden/silver*. Also, the system recognizes duplicate node names (but in a different area, or exchange). If the system finds more than five matches on a node name, you are prompted to retry or accept the first five matches as listed.
- **INTERVAL LENGTH** - The interval length varies according to the selection made at the **REPORT NAME** prompt, and must match those scheduled at the node. Also, "1-hr" is the only valid entry for nodes (see below).

1. If the *trunk* selection was made at the REPORT NAME prompt, then this prompt shows:

INTERVAL LENGTH [1-hr, 6-hrs, 24-hrs: +(1-hr)]:

- a. If you choose *1-hr*, then hourly performance records for both DDS and non-DDS trunks are selected for the Trunk Usage Report.
- b. If you choose *6-hrs*, then 6-hr interval performance records for trunks are selected for non-DDS trunks.
- c. If you choose *24-hrs*, then the daily performance records for DDS trunks are selected.

2. If *concentrator*, *sam*, *samml*, or *tsm8* was selected at the REPORT NAME prompt, then this prompt appears as:

INTERVAL LENGTH [1-hr, 6-hrs: +(1-hr)]:

Choose 1-hr or 6-hrs; 1-hr is the default.

3. If *host*, *node*, or *trkgrp* was selected at the REPORT NAME prompt, then this prompt appears as:

INTERVAL LENGTH [1-hr, 24-hrs: +(1-hr)]:

Choose 1-hr or 24-hrs; 1-hr is the default.

4. For any other selections, the INTERVAL LENGTH prompt does not appear.

- START/END TIME - Specifies the starting and ending times for the report. See below.

1. If *1-hr* was selected at the INTERVAL LENGTH prompt, or the INTERVAL LENGTH prompt did not appear, there are separate prompts for start time and end time as shown below:

START TIME [a value from 0 to 23]:

END TIME [a value from 1 to 24 +(n)]:

There is no default for the start time, but the default for the end time is one more hour than your entry for the start time. If you specify more than one hour, the report is separated in one-hour segments from start time to end time.

2. If *6-hrs* was selected at the INTERVAL LENGTH prompt, then the prompt shown below appears:

START TIME or START TIME - END TIME [a single value from 0 to 23 or a range within 0 through 23; hh or hh-hh +(0-23)]:

Choose a start time/end time that is a multiple of 6.

3. If *24-hrs* is selected at the INTERVAL LENGTH prompt, then there isn't a prompt for a START TIME.

- TRUNK GROUP NAMES - A list of trunk group names (at most 5), separated by commas or by semicolons if prefixed by a node name (<nodename:>), to restrict the set of trunk groups included in the report. Some example entries appear below:

trkgrp1,trkgrp2,trkgrp3
<nodename>: *trkgrp1,trkgrp2*; <nodename>: *trunkA*
<nodename>: +

The + sign means 'all the trunk groups on that node'. The <nodename> can be specified to any level: network, area, exchange, or local node name.

- GROUP NAMES - A list of receiving group names (at most 5), separated by commas or by semicolons if prefixed by a node name (<nodename:>), to restrict the set of groups included in the report. Some example entries appear below:

grp1,grp2,grp3
<nodename>: *grp1,grp2*; <nodename>: *groupA*
<nodename>: +

The + sign means 'all the groups on that node'. The <nodename> can be specified to any level: network, area, exchange, or local node name.

- TRUNK NAMES - List of trunk names (at most 5), separated by commas, to restrict the set of trunks included in the report. A maximum of 5 trunk names may be specified or *all* for all trunks. Choosing the default *all* places no limiting factor on the report according to trunks.

NOTE:

Trunks must be correctly defined in the trunk_info table of the configuration database. The trunk names are created using **cf** commands.

- FORM OF SUMMARY DATA - Specifies whether average values, peak values, or both are included in the report. (Only applies to weekly and monthly reports, not daily.)
- X.25 FOR DATAKIT II VCS - Choose *yes* for X.25 data from a BNS-2000 VCS (*Datakit II VCS*). Your answer produces the appropriate prompts for additional information as explained below:

X.25 MODULE REPORT TYPE - Specifies whether the report is for *performance* or *usage* of the X.25 module. The default is *performance*.

- MULTIPLEXER REPORT TYPE - The type of SAM report desired, either module or port. Choosing *port* produces two prompts, listed below, for module address and board address.

- **MODULE ADDRESS** - (For SAM or SAMML *port* reports). The backplane module address of the multiplexer(s) for SAM or SAMML port reports. Specify a single multiplexer address, or choose the default, which is *all* multiplexers. For example, enter **18** to specify the multiplexer connected to the link module in slot 18 of the node. For SAM, you are then prompted for the board address (see below), unless you chose *all*. For SAMML, you are then prompted for the port number (see below), unless you chose *all*.
- **BOARD ADDRESSES** - (For SAM *port* reports). The board address for the selected multiplexer module(s) SAM port report. Enter a comma-separated list of board addresses (at most 5), or select the default *all*. The board address is the position (slot number) of the board in the SAM. For example, enter **3,5,6** to specify boards 3, 5, and 6 of the multiplexer module specified in the MODULE ADDRESS prompt. You receive a report for all ports on the requested board(s).
- **PORT NUMBER** - (For SAMML and CPMML *port* reports). The port number for the selected SAMML or CPMML. Enter one port number or *all*. Default is *all*.
- **CPMML, TSM8, SAMML, or SDLC8 REPORT TYPE** - The type of report desired, either module or port. Choosing either *module* or *port* produces a prompt for the module address(es) (see below). Choosing *port* also produces a prompt for sorting criteria.
- **MODULE ADDRESSES** - (For TSM8, DKAP, or SDLC8, module or port reports; SAMML or CPMML module reports.) Enter a comma-separated list of addresses (at most 5), or choose the default, which is *all*. For example, enter **2,3,5** to specify the modules in slots 2, 3, and 5 of the node.
- **FRM REPORT TYPE** - The type of FRM report desired: module, facility, port, or dlci; default is *module*. If *dlci* is selected, you are prompted for the type of dlci report. See next item.
- **FRM DLCI REPORT TYPE** - The type of FRM dlci report desired: utilization or congestion; default is *utilization*.
- **FRM-M2 REPORT TYPE** - The type of FRM-M2 report desired: module, port, virtual port, or dlci; default is *module*. If *dlci* is selected, you are prompted for the type of dlci report. See next item.
- **FRM-M2 DLCI REPORT TYPE** - The type of FRM-M2 dlci report desired: utilization or congestion; default is *utilization*.
- **X.75 REPORT TYPE** - The type of X.75 report desired: module or port; default is *module*. If *port* is selected, you are prompted for the type of port report. See next item.
- **X.75 PORT REPORT TYPE** - The type of X.75 port report desired: utilization or performance; default is *performance*.

- **SORTING CRITERIA** - (For CPMML, SDLC8, TSM8, DKAP, or SAMML port reports.) Specify whether the port report is to be sorted by component address (that is, port address) or by reporting interval; default is *address*.
- **CONCENTRATOR NAMES** - List of concentrator names (at most 5), separated by commas, to restrict the set of concentrators included in report. A maximum of 5 concentrator names may be specified or *all* for all concentrators. Choosing the default *all* places no limiting factor on the report according to concentrators.

Example of Report Prompting/Entry Sequences

Shown below is an example of the prompting and entry sequence to produce a monthly Trunk Group Availability performance report. The entry instructions appear in *italics*.

```
SK: report
REPORT TYPE [ alarm, billing, performance ]: p
NODE TYPE [ BNS-1000, Datakit, DKII, ISN, network ]: dkii
REPORT NAME [ bisync, concentrator, cpmml, dkap, frm, frm-m2, host, node, sam,
              samml, sdlc8, trkgrp, trunk, tsm8, x25, x75: +(bisync) ]: trkgrp
SUMMARY PERIOD [ daily, weekly, monthly: +(daily) ]: m
BEGINNING DATE OF SUMMARY PERIOD [ mmddyy: +(<1st of completed month>): <CR>
TRUNK GROUP NAMES [list of group names (at most 5),
                   optionally prefixed by node name (at most 5);
e.g., "grp1,grp2" or a1/e1/n1:grp3,grp4; a2/en/n2:grp5,grp6" : +(all) ]:
                                specify group, groups, or all groups
INTERVAL LENGTH [ 1hr, 24-hrs, : +(1-hr) ]: choose 1 or 24
START TIME [ a value from 0 to 23 ]: this prompt only appears if you chose 1hr
END TIME [ a value from 1 to 24: +(1) ]: (1)
FORM OF SUMMARY DATA [ averages, peaks, or both: +(averages) ]: choose a, p, or b
REPORT OUTPUT [ printer or screen: +(screen) ]: choose p or s
```

Screen 6-1. Prompting Sequence for Trunk Group Availability Report

Field Descriptions for Performance Report Column Headings

The following is a list of fields (column headings) for performance reports. The items are in alphabetical order, including field names that begin with special marks (for example, % will be under percent), and a brief description of each item. In the reports, some of the columns have a tiered format; that is, one field of information rests on top of another field in the same column. For example, one column has NAME over TYPE over SPEED, so the data are in three lines with the name of the item over the type of the item over the speed of the item. Some reports have slightly altered or abbreviated column headings to preserve space. Use this list to help decipher the meaning of the data in the report columns.



NOTE:

The designation “*pk*” seen in some of the fields below (e.g., *BYTES*, -*pk rcv*, -*pk xmt*) indicates that the information is for a peak five-minute interval.

- **ABNORM EOT** - The number of abnormal ends of transmission (EOT) for each port.
- **ABNORM STATUS SENSE** - The number of abnormal status and sense messages received.
- **ABNORM TERM** - The number of abnormal terminations of transmission for each port.
- **ADDR, -mod** - Same as **MODULE ADDRESS**.
- **ADDR, -mod, -port** - The module address (first line) and the port number (second line) for the FRM module and port of the report.
- **ADDR, -mod, -port, -vport** - The module address (first line), the physical port number (second line), and the virtual port number (third line) for the FRM-M2 module and port of the report.
- **ADDR, -mod, -port, -dlci** - The module address (first line), the port number (second line), and the DLCI number (third line) for the FRM module and port of the report.
- **ADDR, -mod, -port, -vport, -dlci** - The module address (first line), the physical port number (second line), the virtual port number (third line), and DLCI number (fourth line) for the FRM-M2 module and port of the report.
- **ATM SEGS, -fm node, -to node** - The total number of ATM segments that have been received at the backplane (first line) and the total that have been sent from the backplane (second line).
- **AVAILABILITY (%) for a node** - The percent availability of a node to *StarKeeper II* NMS; it is measured by the proportion of time a console connection can be maintained between *StarKeeper II* NMS and that node.
- **AVAILABILITY (%) for a trunk** - The percent availability of a trunk to *StarKeeper II* NMS; it is derived by calculating the interval represented by two status messages, namely trunk down and trunk alive, and dividing by the hours the node is available.
- **AVERAGE FRAME SIZE, -pk rcv, -pk xmt, -rcv, -xmt** - The average frame size value is calculated by dividing the number of bytes by the number of frames (received or transmitted). The value can be used to determine the cause for high utilization. Small frames reduce throughput as their high overhead results in increased processing.
- **AVERAGE CALLS** - The average number of simultaneous calls.
- **BAD FCS** - The number of frame sequence errors detected on frames received by the port.

- **BAD FRAMES** - The number of port frames discarded due to a frame format error (e.g., non-integral number of octets, aborted frames, etc.).
- **BUFFERS NOT AVAIL** - The number of times buffers were not available for the module and port.
- **BYTES, -pk rcv, -pk xmt, -rcv, -xmt** - The number of bytes that the FRM or FRM-M2 module received from (rcv) or sent to (xmt) the line for the port (FRM) or virtual port (FRM-M2), or for an individual dlci.
- **BYTES TOTAL** - The total number of bytes received from and transmitted to the port.
- **CALL ATTEMPTS *for host access*** - The total number of attempts to create a new connection into this group during the reporting interval.
- **CALL ATTEMPTS *for node usage*** - The total number of attempts to create a new connection into all the receiving groups and trunk groups of this node during the reporting interval.
- **CALLS ACCPT** - The number of calls accepted.
- **CALLS ATTMP** - The number of calls attempted.
- **CHANNEL** - The number of the module channel being reported on.
- **CHANNEL ERRORS** - The total number of backplane packets discarded due to a channel error.
- **CHANNELS IN SRVCE** - The number of X.25 logical channels currently in service.
- **CONGEST, -rcv cnt, -xmt cnt, -rcv secs, -xmt secs** - In the FRM-M2 virtual port level report, this field represents the number of times or the number of seconds in which the virtual port went into buffer congestion.
- **CONGESTION, -count, -seconds *also CONGEST, -cnt, -secs*** - A count of the total number of times (first line) or the total number of seconds (second line) the module went into buffer congestion during the report interval.
- **CONNECT ATTEMPTS** - The number of attempts to create a new connection into this trunk group during the reporting interval.
- **CONT UNIT** - The control unit number (address) for each device off the port.
- **CRC ERROR RCVD** - The number of frames received with CRC errors.
- **CRC ERRORS** - The number of port frames discarded due to cyclic redundancy check (CRC) errors on the line.
- **DISCARDED FRAMES, (>Bc+Be)** - The total number of frames discarded because they exceeded the configured maximum throughput [the sum of the committed burst size (Bc) and excessive burst size (Be)] are shown.

- DISCARDED FRAMES, - >Bc+Be, -By Network - The total number of frames discarded because they exceeded the configured maximum throughput [the sum of the committed burst size (Bc) and excessive burst size (Be)] are shown on the first line in the FRM-M2 report. The second line of the FRM-M2 report shows the number of frames discarded because they were corrupted, incomplete or the module had no available buffers.
- FAILS CONT - The number of unsuccessful connection attempts due to contention. This means that there were no free ports into this receiving group, and, thus, no available access to host, printer, and other services.
- FAILS OTHER - The number of unsuccessful connection attempts due to reasons other than FAILS CONT. For example, when the service address accessing this group is out of service, or the host has crashed.
- FAILS SEC - The number of unsuccessful connection attempts due to closed user group security.
- FAILS TOTAL - The number of unsuccessful connection attempts due to reasons other than contention or closed user group security. These call failures include components being out of service (for example, the service address is out of service), hardware or software component failures (for example, the host has crashed), routing errors (for example, there is a loop or dead end in the network), or other (unknown) reasons.
- FAR END, -%Err Free Seconds, -Line Errored Seconds, - Code Viol (FE BEr for E1), -Errored Seconds, - Severe Err Seconds, - Sev Err Frame Seconds, - Frame Slip Seconds - This column in the FRM Facility and the FRM-M2 Port Performance Reports displays the number of each of the listed error counts.
- FIFO INTRPT - These are HALF FULL FIFO INTERRUPTS. It represents the number of times the FIFO reached the half full state during the interval.
- FRAME FORMAT - the format of the incoming frames: esf, crc4-cept, etc.
- FRAMES, -pk rcv, -pk xmt, -rcv, - xmt - For ports, the number of frames output to the line.
- FRAMES, -rcv, -xmit - For DLCI, this field provides the total number of frames received and transmitted on the DLCI.
- FRAMES, -rej rcv, -rej xmit - The number of times the remote FRM sent a reject (-rej rcv: first line) indicating it had to discard corrupted data, detected missing data, or had no available buffers. Or, the number of times the FRM had to discard data received (-rej xmit: second line) because it was corrupted, data was missing, or no buffers were available on the module.
- FRAME BYTES - Total bytes in level 2 frames received from and transmitted to the port.

- **FRAMES DISCARDED** (congestion), -rcv, -xmt - The number of received (first line) or transmitted (second line) frames discarded because of insufficient buffer space or enforced congestion control.
- **FRAMES WITH CONGESTION BIT SET**, -rcv FECN, -xmt FECN, -rcv BECN, -xmt BECN - The number of frames received with the congestion bit set for forward explicit congestion notification (FECN) or for backward explicit congestion notification (BECN) are indicated on the first and third lines, respectively. The second and fourth lines indicate the number of frames transmitted with the congestion bit set for FECN or BECN, respectively.
- **FRAMES WITH DE BIT SET BY NETWORK**, -rcv, -xmt - The total number of frames received (first line) or transmitted (second line) with the discard eligibility (DE) bit set by the network.
- **FRAMES WITH DE BIT SET BY MODULE** - The total number of frames with the DE bit set by the FRM or FRM-M2 module.
- **FROM DK ERRORS** - *for multiplexer reports* The number of intervals (3.2 seconds) in which data blocks containing errors were received by the specified multiplexer port.
- **FROM DK TRAFFIC** - *for multiplexer reports* The number of intervals (3.2 seconds) in which one or more characters of traffic traveled from the node to the specified multiplexer port.
- **FROM NODE BYTES** - The number of bytes transmitted by the node's trunk module. Byte count includes user data and overhead.
- **FROM NODE PACKETS** - The number of packets coming into the module from the backplane. It is the sum of in-service packet counts.
- **GROUP** - The trunk group name to which this trunk belongs.
- **IDLE (%)** - The percentage of time the module was idle, averaged over the interval.
- **INTRPTS** - The number of half FIFO interrupts (X.75 module).
- **INVTVL** *also INTERVAL* - Same as REPT INTVL.
- **LINK PAR ERR** - The number of concentrator link parity error indicators.
- **LTYPE, SPEED** - Displays (on the first line) the type of link or LIM (SWT or SFT); and shows the bps rate of the trunk (on the second line).
- **MIN IDLE** - The minimum module CPU idle time percentage recorded during the interval; calculated over 5 minutes.
- **MOD** - The number of the module (slot number) being reported on.
- **MOD #** - *for multiplexer reports* Backplane link module address; SAMML and SAMDL includes port number.
- **MODULE ADDRESS** *also MOD ADD* - The backplane address (slot number) of the module being reported on.

- MOD ADDR.PORT - A two-part entry for the module being reported on (the slot number) and the port number, separated by a dot.
- MOD ADDR.PORT,SPEED - A two-line entry. The first line is for the module being reported on (the slot number) and the port number (separated by a dot); the second line shows the module's rated speed (in bps).
- MOD TYPE, MOD ADDR - *for multiplexer reports* - The module type and address being reported on. Module types are: AMUX64, AMUX504, SAM64, SAM504. Module address is: link address/board.port; for example, 18/2.3.
- MOD TYPE,TRK TYPE - *for multiplexer reports* The multiplexer type and the type of trunk connected to the multiplexer. Module types are SAM64 and SAM504. Trunk types are HS, T1, SAMML, SAMDL, and SAMSL.
- MSGS TOTAL - The total number of messages received from and transmitted to the port.
- NAME,TYPE,SPEED - This displays the trunk name, with the trunk type listed below it, and the trunk speed listed below that.
- NEAR END, -%Err Free Seconds, -Line Errored Seconds, - Code Viol (FE BEr for E1), -Errored Seconds, - Severe Err Seconds, - Sev Err Frame Seconds, - Frame Slip Seconds - This column in the FRM Facility and the FRM-M2 Port Performance Reports displays the number of each of the listed error counts.
- NEAR END AIS SECS - The total time in seconds during which an incoming alarm indication signal (AIS) was present.
- NEAR END BER6 SECS - The total time in seconds during which an incoming ber6 (two or more CRC4 errors detected in a one-second interval) was present.
- NEAR END LINE CODE VIOL - The total number of non-valid bipolar line code violations encountered in the report interval.
- NEAR END LINE SEVERE ERRED SECS - A count of the number of seconds with 16 or more line code violations.
- NEAR END UNAVAIL SECS - The total time in seconds the service was unavailable on the FRM facility or FRM-M2 physical port during the report interval.
- NET/DNIC, AREA/SR, EXCH/SA, NODE - The full node name as used by *StarKeeper II* NMS.
- NODE *or* NODE NAME - The name of the node being reported on as known by *StarKeeper II* NMS, in the four-level mnemonic/numeric address format.
- NODE PAR ERR - The number of node link parity error indicators.
- NODE1 - The full name of one of this trunk's end nodes.
- NODE2 - The full name of the other end node for this trunk.

- OVERFLOWS, -fm bckpl, -to bckpl - The rate at which information arriving at the FRM-M2 from the backplane (fm bckpl) or sent to the backplane (to bckpl) exceeded the rate at which information could be processed by the module.
- PACKETS, -fm node, -to node *also PACKETS, -recv, trans* - The total number of packets that have been sent to the module from the node's backplane (first line) and the total number of packets that have been sent from the module to the node's backplane (second line).
- PACKETS FROM (TO) BUS - The number of packets received from and going to the node backplane (bus).
- PACKETS FROM (TO) NODE - The number of packets received from and going to the node backplane, through the module.
- PACKETS RECEIVED - The number of packets received from the node and sent to the module.
- PACKETS TRANSMITTED - The number of packets sent from the module to the node.
- PKTS FROM - *for concentrator reports* The number of packets sent from the concentrator (to the node) during the report interval.
- PKTS TO - *for concentrator reports* The number of packets sent to the concentrator (from the node) during the report interval.
- PARITY ERRORS *also* PAR ERR - The number of node backplane envelopes discarded due to a parity error.
- PEAK CONNECTIONS *also* PEAK CONN - The maximum number of all simultaneous connections (switched and non-switched) that occurred during the report interval. When both peaks *and* averages are requested, the data in parentheses contain the averages.
- % AVG BUSY, recv, -trans - The average percent bandwidth used in a particular direction for that port. The first line is receive; the second line is transmit.
- % AVG MAIN UTIL or % AVG MAIN UTILIZATION - The average percent utilization of the main processors over the measurement interval.
- % BUSY - The percentage of time the module was busy, averaged over the hour. It is calculated by subtracting the average % IDLE TIME (coming from the node) from 100%. Another way of expressing this is as the average CPU busy time during the hour.
- % CHAN UTIL - The number of peak connections divided by the number of in-service channels in a group.
- %IO BOARD UTIL, -pk, -avg - The peak and average utilization of the FRM I/O board over the measurement interval.

- % MIN IDLE - The percentage of idle time is saved for each 8-minute interval; the minimum idle time recorded for the reporting interval is then displayed.
- % OVHD BYTE - The percentage of overhead (nondata) bytes
- % PEAK BUSY, -recv, -trans - The peak percent bandwidth used in a particular direction for that port. The first line is receive; the second line is transmit.
- % PEAK MAIN UTIL or %PEAK MAIN UTILIZATION - The percent utilization of the main processors over a five-minute peak interval.
- % PEAK UTIL (FROM DK) - *for multiplexer reports* The peak utilization of the link. It is the traffic received divided by the line capacity, at peak times during the interval.
- % PEAK UTIL (TO DK) - *for multiplexer reports* The peak utilization of the link. It is the traffic transmitted divided by the line capacity, at peak times during the interval.
- % PORT UTIL - The number of peak connections divided by the number of in-service ports in a group.
- % TRK UTIL (FROM DK) - *for multiplexer reports* The average utilization of the link. It is the traffic received divided by the line capacity during the interval.
- % TRK UTIL (TO DK) - *for multiplexer reports* The average utilization of the link. It is the traffic transmitted divided by the line capacity during the interval.
- % UTIL, -pk rcv, -pk xmt, rcv, xmt - The total bytes received or transmitted on the line divided by the speed of the line (or, the bandwidth used) in either direction during the measurement interval.
- % UTIL,-recv,-trans *also* % UTIL, -rcv, -xmt - The average trunk utilization over the interval; the number of bytes divided by trunk capacity—in transmit and receive directions. Percentages are on two lines: first line is receive and second line is transmit. Byte counts are based on all data collected.
- % UTIL,-recv,-trans - *for concentrator reports* Link average utilization: This is the number of packets sent and received divided by link capacity.
- PORT - The port being reported on.
- PORT SPEED - The speed (in bps) for which the port was configured (not necessarily the speed at which the port is running).
- PORT UTIL REC% - The percentage of the characters received by the port divided by the port capacity, during the interval.
- PORT UTIL TRANS% - The percentage of the characters transmitted by the port divided by the port capacity, during the interval.
- RCV MSGS - The number of messages received from the device.

- RCVR ABORTS - The number of frames discarded by the node due to receiving an abort sequence from the port. It represents the total number of frames discarded from all aborts during the interval for this port.
- RCVR CRC - The number of frames that contain corrupted data (receiver crc errors).
- RCVR OVRN - The number of receiver overruns; this occurs when the module cannot keep up with the incoming data.
- RECV GROUP - The name of the receiving or two-way group for the reported connection data.
- RECEIVER, -overruns - The number of receiver overruns that occurred on the facility (FRM) or virtual port (FRM-M2) during the measurement interval. An overrun occurs when frames are received faster than they are stored and forwarded because the module processor is too busy.
- RECEIVER, -bad frames - Same as RCVR CRC.
- REJECTS RECEIVED - The number of times the remote end had to discard data due to either data corruption, or the remote module had no available buffers.
- REJ FRAMES - The number of transmitted/received "Rejected" frames. A rejected frame is used by an X.75 module to request retransmission of I frames starting with the frame numbered N(R). I frames numbered [N(R)-1] and below are acknowledged.
- REPT INTVL - Start and end time of the reporting interval.
- RNR (Received Not Ready) FRAMES - The number of transmitted/received RNR frames. RNR frames are used by an X.75 module to indicate a busy condition; that is, the temporary inability to accept additional incoming I frames.
- SPEED - Same as PORT SPEED.
- TERM NO. - The terminal number for each device off the port.
- TO DK RETRAN - *for multiplexer reports* The number of intervals (3.2 seconds) that the node required the multiplexer to retransmit a block (a subset of packets).
- TO DK TRAFFIC - *for multiplexer reports* The number of intervals (3.2 seconds) in which one or more characters of traffic traveled from the specified multiplexer port to the node.
- TO NODE BYTES - The estimated number of bytes received at the node's trunk module. Byte count includes all data.
- TO NODE PACKETS - The number of packets going out of the module to the backplane. It is the sum of in-service packet counts.

- TOTAL BYTES (FROM DK) - *for multiplexer reports* The total number of bytes sent out to the multiplexer (from the node).
- TOTAL BYTES (TO DK) - *for multiplexer reports* The total number of bytes sent to the node from the multiplexer.
- TOTAL BYTES RECEIVED - The number of bytes received from the external host or device.
- TOTAL BYTES TRANSMIT - The number of bytes transmitted to the external host or device.
- TOTAL RCVR ABORTS - The number of receiver aborts. See RCVR ABORTS.
- TOTAL RECEIVER OVERRUN - The number of receiver overruns. This occurs when the module cannot keep up with the incoming data. See RCVR OVRN.
- TOTAL TRANS UNDRUN - The number of frames aborted by the port.
- TRAN MSGS - The number of messages transmitted to the device.
- TRANS UNDRUN OTHER - The number of transmission underruns due to conditions other than pipelining.
- TRANS UNDRUN PIPELN - The number of transmission underruns due to pipelining.
- TRUNK NAME - The name of the trunk being reported on.
- TRUNK TYPE - The type of trunk being reported on.
- USART ERRORS - *for multiplexer reports* The number of intervals (3.2 seconds) in which the USART associated with the specified multiplexer port had either an overflow, parity, or framing error.
- USER BYTES - Total user data bytes received from and transmitted to the port.

Getting FRM and FRM-M2 Performance Reports Using **sched_report**

With the **sched_report** command, you can schedule FRM and FRM-M2 performance reports to be run at a particular time. By choice of options, you can specify the report information needed and when the report should be generated. The options in this command may be entered in any order, and the **sched_report** command can be run in real time if the set date (**-sd**) and set time (**-st**) options are omitted. The command allows you to view scheduled requests (**sched_report -l**) by job id and cancel pending requests (**sched_report -r <job_id>**).

Continuous use of **sched_report** will lead to ever-growing log files in the directory *\$HOME/sched_scripts*, or, when running the command in real time, in the directory */tmp*. Users must clean up these log files periodically.

It is recommended that you first execute the **sched_report** command in real time before entering the command for later execution. Because of the number and types of options that may be specified with this command, running it first can eliminate typographical and syntax errors. This will ensure that scheduled reports actually run when scheduled. The best approach is to enter the command as a shell script, and once it has run properly in real time, edit the script to add the date and time information. Refer to the online help for the **sched_report** command for complete details of syntax and allowed arguments.

Bisynchronous Device Usage Report

This report provides usage information for BSC3270 modules. Significant items include the numbers of bytes and messages received from and transmitted to the port, numbers of messages received from and transmitted to the device, and the number of abnormal messages.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM										
BISYNC DEVICE USAGE REPORT										
printed: 01-02-98 14:46										
daily: 01-01-98										
reporting intervals: 00:00 - 11:59										
interval length: 1-hour										
node type: BNS-2000										
modules: all										
NET/DNIC	MOD	REPORT	BYTES	MSG	CONT	TERM	RCV	TRAN	ABNORM	
AREA/SR	PORT	INTRVL	TOTAL	TOTAL	UNIT	NO.	MSG	MSG	STATUS	
EXCH/SA									SENSE	
NODE										
national	25.1	11:00	5609270	185435						
east										
garden										
node20										
					2	1	84	58	84	
					2	2	95	49	95	
					2	3	67	96	67	
					2	4	94	69	94	
					2	5	01	20	01	

Screen 6-2. Sample Bisynchronous Device Usage Report

Report Interpretation

This report shows the control unit and terminal measurements for bisynchronous service. It shows a level of detail beyond the port level, which is shown in the Bisynchronous Module Performance Report.

This report is useful in interpreting line problems found in the Bisynchronous Module Performance Report. For example, if there is too much traffic for a port, this report will show which control units and terminals are responsible for the increased traffic.

The RCV MSGS and TRAN MSGS show the traffic on the line between the port and the device. The ABNORM STATUS SENSE is an error indicator for the line.

Bisynchronous Module Performance Report

This report provides performance information for BSC3270 modules. Significant items include the numbers of packets to and from the node, the idle time for each module, and the utilization of each port.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM											
BISYNC MODULE PERFORMANCE REPORT											
printed: 01-02-98 14:46											
daily: 01-01-98											
reporting intervals: 00:00 - 11:59											
interval length: 1-hour											
node type: BNS-2000											
trunks: all											
NET/DNIC	MOD	REPORT	IDLE	PKTS	PKTS	PORT	UTIL	ABNORM	BUFFERS		
AREA/SR		INTRVL	(%)	FROM	TO		(%)	EOT	NOT		
EXCH/SA				NODE	NODE		-recv		AVAIL		
NODE							-trans				
national	25	11:00	99	15	24				0		
east											
forest											
node22											
						1	0	12543	48593		

Screen 6-3. Sample Bisynchronous Module Performance Report

Report Interpretation

This report shows the usage and performance of the Bisynchronous module in relation to the node backplane. It also shows the usage of the ports in relation to the outgoing lines. The purpose of this report is to help identify and troubleshoot problems in bisynchronous service, whether caused by the module, port, or the line leading out of the port.

A value of % IDLE that is higher or lower than average should be checked. A low % IDLE can indicate that the module is not being used, either because there is no user-initiated traffic or because there is a problem on the line side. The % IDLE value can be high with no adverse effect on performance. The error counts, however, do indicate a problem between the module and the backplane. That problem could be too much traffic for the module, given its location and the node it is in; or a malfunctioning module. BUFFER NOT AVAIL may indicate that incoming traffic is exceeding the capacity of the module.

The key field in this report is the % UTIL for the port. Port utilization is similar to trunk utilization. The port utilization is the average value for that interval, and is calculated by dividing the traffic by the capacity. A general guideline is that average port utilization should not exceed 70%, not because of the port itself but because of the transmission facility to which it is connected. An average below 70% means that the peak utilization should be safely under 100%.

Concentrator Usage Report

This report contains measurements for SFT and SWT trunks used to link supported concentrators to a node, as well as error counts for both ends of the link. It is very sensitive to correct user input on concentrator configuration in the configuration database. The data are sorted first by end node name, then by concentrator name, and finally by report interval.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM									
CONCENTRATOR USAGE REPORT									
printed: 01-02-98 14:46									
daily: 01-01-98									
reporting intervals: 00:00 - 11:59									
interval length: 1-hour									
node type:BNS-2000									
concentrators: all									
NET/DNIC	CONC	ADD	LTYPE	REPT	% UTIL	PKTS TO	PKTS FROM	NODE	LINK
AREA/SR	NAME		SPEED	INTVL	-recv			PAR ERR	PAR ERR
EXCH/SA	TYPE				-trans				
NODE									
national	1		SFT	11:00	90	124611173	123224226	10	1
west	conc11		8.64	16:59	88				
957	FRS								
node20									
				15:00	16	21111111	586211	28	4
				20:59	6				
national	130		SFT	11:00	5	936	52341	0	8
west	conc110		8.64	16:59	20				
957	CCOM								
node20									

Screen 6-4. Sample Concentrator Usage Report

Report Interpretation

This report shows the usage and performance of the link that connects the concentrator to the node. It is similar to the Trunk Usage Report because trunks and links are both transmission facilities. Like the Trunk Usage Report, the key field is % UTIL, which represents how much of the physical link is being used. The % UTIL is the average utilization of the link during the interval. A general guideline is that average link utilization should not exceed 70%.

The error counts indicate the health of the link module in the node backplane. Increased error counts may indicate problems in the link module or the physical trunk. Error counts may or not be related to the % UTIL. For example, high usage and several errors can indicate that the link module is retransmitting and thereby creating traffic.

If a value in the % UTIL field cannot be explained by usage or errors, it is possible that the configuration information (particularly the link speed) was entered incorrectly in the database. The report uses the speed of the link from the database in its calculations.

CPMML Module Performance Report

This report provides module-level usage and performance measurements for a Computer Port Module - Multiport-Link (CPMML). The first columns (% BUSY, FROM NODE PACKETS, and TO NODE PACKETS) show the usage of the module and the last columns (PARITY ERRORS, CHANNEL ERRORS) show the performance of the module. Usage is a measure of the traffic, and performance is a measure of errors.

Reports are available on a module or port basis, and at a frequency of daily, weekly, or monthly. Below is a sample *daily* CPMML *module* performance report. (The next section describes the CPMML *port* performance report.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM							
CPMML MODULE PERFORMANCE REPORT							
printed: 01-02-98 14:46							
daily: 01-01-98							
reporting intervals: 00:00 - 11:59							
node type: BNS-2000							
nodes: all							
modules: all							
NET/DNIC AREA/SR EXCH/SA NODE	MODULE ADDRESS	REPT INTVL	% BUSY	FROM NODE PACKETS	TO NODE PACKETS	PARITY ERRORS	CHANNEL ERRORS
national	10	9:00	10%	88	36	0	0
west		9:59					
957							
node20							
		10:00	43%	283	663	0	0
		10:59					

Screen 6-5. Sample Daily CPMML Module Performance Report

Report Interpretation

The CPMML module can be in a slot on the node's backplane or in a slot in a concentrator.

For weekly and monthly reports you can request peak values and/or averages. If both are requested, the peaks are listed first and the averages are shown in parentheses under the peaks. Usage and performance measurements for a module may or may not be related. Usage is a measure of the traffic and performance

is a measure of errors—usually hardware related. These two types of measurements can complement each other. For example, high usage and several errors can indicate a module that is retransmitting and thereby creating traffic.

The report shows the usage and performance of the CPMML module in relation to the node backplane. Use the report to help troubleshoot problems that are detected in other reports, such as port utilization reports. For example, problems with port utilization could be caused by an overworked (high usage or too much traffic) module. This report is also useful for monitoring the performance of newly installed or suspect CPMML modules.

The % BUSY value can be high with no adverse affect on performance. The error counts, however, do indicate problems between the module and the backplane. A channel error may be caused by faulty module software or hardware. A parity error may be caused by faulty hardware in the node or inserting a circuit pack in the backplane.

CPMML Port Performance Report

This report provides port-level usage and performance measurements for Computer Port Module - Multi-Link (CPMML) modules. The first columns (%UTIL and TOTAL BYTES, in each direction) shows the usage of the port. The last columns (RCVR ABORTS, CRC ERRORS) show the performance of the port and/or wire.

Below is a sample, daily CPMML *port* performance report sorted by port address; the report is also available sorted by report interval. (The previous section describes the CPMML *module* performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM									
CPMML PORT PERFORMANCE REPORT									
printed: 01-02-98 14:46									
daily: 01-01-98									
reporting intervals: 00:00 - 11:59									
node type: BNS-2000									
nodes: all									
modules: 3									
ports: all									
sort: address									
NET/DNIC	MOD	PORT	REPT	%UTIL	TOTAL	BYTES	RCVR	CRC	
AREA/SR	ADDR.	SPEED	INTVL	-recv	-recv		ABORTS	ERRORS	
EXCH/SA	PORT			-trans	-trans				
NODE									
national	12.1	9600	2:00		R	76		1	0
west			2:59		T	788		12	9
957									
node1									
			3:00		R	889		1	0
			3:59		T	788		2	9
			4:00		R	1234		21	0
			4:59		T	9788		12	9

Screen 6-6. Sample CPMML Port Performance Report (Module Address)

Report Interpretation

This report shows the usage and performance of the CPMML ports in relation to the user endpoints. The purpose of this report is to help identify and troubleshoot problems. This report can also be used to identify problems with the transmission facility (for example, a wire). For example, RCVR ABORTS can be due to noise on the wire or to the remote end being overloaded. CRC ERRORS indicate problems with the wire.

DKAP Channel Performance Report

This report provides channel-level usage and performance measurements for *Datakit Applications Processor* (DKAP) modules. The (TOTAL BYTES, in each direction column) shows the usage of the channel. The BUFFER NOT AVAIL column shows the performance of the channel and/or wire.

Below is a sample, daily DKAP *channel* performance report sorted by channel address; it is also available sorted by report interval. (The previous section describes the DKAP *module* performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM					
DKAP CHANNEL PERFORMANCE REPORT					
printed: 01-02-98 14:46					
daily: 01-01-98					
reporting intervals: 00:00 - 11:59					
node type: BNS-2000					
nodes: all					
modules: all					
sort: interval					
NET/DNIC	MOD	REPT	TOTAL	BYTES	BUFFER
AREA/SR	CHANNEL	INTVL	-recv		NOT
EXCH/SA			-trans		AVAIL
NODE					
national	27	6:00	R	311	0
west	1	6:59	T	278	
957					
node20					
		7:00	R	789	0
		7:59	T	964	
		8:00	R	278436	4
		8:59	T	346069	
		9:00	R	857804	11
		9:59	T	838963	

Screen 6-7. Sample DKAP Channel Performance Report (Channel Address)

Report Interpretation

This report shows the usage and performance of the DKAP channels in relation to the user endpoints. The purpose of this report is to help troubleshoot problems that are detected in other reports, such as the DKAP Module Performance Report. This report can also be used to identify problems with the transmission facility (for example, a wire).

BUFFER NOT AVAIL indicates the incoming traffic is exceeding the capacity of the channel.

DKAP Module Performance Report

This report provides module-level usage and performance measurements for a *Datakit Applications Processor* (DKAP) module. The first columns (% BUSY, FROM NODE PACKETS, and TO NODE PACKETS) show the usage of the module and the last columns (FIFO INTRPT, BUFFER NOT AVAIL) show the performance of the module.

Reports are available on a module or port basis, and at a frequency of daily, weekly, or monthly. Below is a sample *daily* DKAP *module* performance report. (The next section describes the DKAP *channel* performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM							
DKAP MODULE PERFORMANCE REPORT							
printed: 01-02-98 14:46							
daily: 01-01-98							
reporting intervals: 00:00 - 11:59							
node type:BNS-2000							
nodes: all							
modules: all							
NET/DNIC MOD AREA/SR ADDR EXCH/SA NODE	REPT INTVL	%BUSY	FROM NODE PACKETS	TO NODE PACKETS	FIFO INTRPT	BUFFER NOT AVAIL	
national 11	9:00	11%	588	336	0	0	
west	9:59						
957							
node20							
	10:00	10%	283	663	0	0	
	10:59						

Screen 6-8. Sample Daily DKAP Module Performance Report

Report Interpretation

For weekly and monthly reports you can request peak values and/or averages. If both are requested, the peaks are listed first and the averages are shown in parentheses under the peaks.

Usage and performance measurements for a module may or may not be related. Usage is a measure of the traffic and performance is a measure of errors—usually hardware related. These two types of measurements can complement each other. For example, high usage and several errors can indicate a module that is retransmitting and thereby creating traffic.

The report shows the usage and performance of the DKAP module in relation to the node backplane. Use the report to help troubleshoot problems that are detected in other reports, such as port utilization reports. For example, problems with port utilization could be caused by an overworked (high usage or too much traffic) module. This report is useful for monitoring the performance of newly installed or suspect DKAP modules.

The % BUSY value can be high with no adverse affect on performance. The error counts, however, do indicate problems between the module and the backplane. Those problems could be too much traffic for the module, given its location and the node it is in; or a malfunctioning module. FIFO INTRPT indicates that the module is getting too busy. BUFFER NOT AVAIL indicates incoming traffic is exceeding the capacity of the module.

FRM and FRM-M2 Performance Reports



NOTE:

FRM and FRM-M2 performance reports can be generated by using either the **report** or **sched_report** command.

This set of ten reports provides performance data for frame relay modules FRM and FRM-M2. A listing of available reports is given in Table 6-1. Example of these reports are presented in the following screens with the FRM reports shown first followed by the FRM-M2 reports.

FRM Module Performance Report

This report provides module performance data for an FRM module.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM FRM MODULE PERFORMANCE REPORT printed: 01-02-98 14:46 Daily: 01-01-98 reporting intervals: 00:00 - 11:59 nodes: all module: all						
NODE NAME	ADDR -mod	INTVL	%AVG MAIN UTILIZATION	%PEAK MAIN UTILIZATION	PACKETS -fm node -to node	CONGESTION -count -seconds
national	20	16:00	72	80	7111858	0
east		16:59			694	0
957						
node20						
	72/2	16:00	30	54	9234681	
		16:59			2461	
national	22	16:00	39	53	8643296	
east		16:59			12668	
957						
node21						

Screen 6-9. Sample FRM Module Performance Report

Report Interpretation

This report shows the performance of FRM modules. The percentage values found in the %AVG MAIN UTILIZATION and %PEAK MAIN UTILIZATION fields can be used to determine if the module is being used at its full capacity. The CONGESTION and PACKET fields give an indication of the traffic flow on the backplane. If these values are being used to determine if the module, port, or virtual circuit is overloaded or congested, they should be used in conjunction with the DISCARDED FRAMES statistics in the FRM DLCI Utilization Report to determine if the buffer space is adequate for the traffic.

In particular, the CONGESTION field gives an indication of severe congestion and affects all ports on the module. A high CONGESTION count may mean that the network should be re-engineered to reduce the load on the module. Use the CONGESTION field in conjunction with the %AVG MAIN UTILIZATION and % PEAK MAIN UTILIZATION fields to determine if the module is overloaded.

FRM Facility Performance Report

This report provides performance data for an FRM facility.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM								
FRM FACILITY PERFORMANCE REPORT								
printed: 01-02-98 14:46								
Daily: 01-01-98								
reporting intervals: 00:00 - 11:59								
nodes: all								
module: all								
NODE	ADDR	%IO	NEAR	NEAR	NEAR	NEAR	NEAR END	FAR END
NAME	-mod	BOARD	END	END	END	END	-% Err Free Seconds	
		UTIL	UN-	LINE	LINE	AIS	-Line Errored Seconds	
		-pk	AVAIL	CODE	SEVERE	SECS	-Code Viol(FE BEr if crc4)	
	-----	-avg	SECS	VIOL	ERRED	-----	-Errored Seconds	
					SECS	NEAR	-Severed Err Seconds	
	INTVL					END	-Sev Err Frame Seconds	
FRAME						BER6	-Frame SlipSeconds	
FORMAT						SECS		

national	20	26	0	12	23	0	100	100
east		12					0	0
957						-----	0	0
node20	-----					N/A	0	0
	16:00						0	0
-----	16:59						0	0
esf							0	0

Screen 6-10. Sample FRM Facility Performance Report

Report Interpretation

This report shows the performance of FRM facilities. Use the error counters to determine if there are line problems at the facility or far end DTF equipment. In particular, the LINE CODE VIOL field should be checked to identify the cause of near-end LINE ERRD SECS and LINE SEVERE ERRD SECS. Use the CODE VIOL field to identify the cause of facility errored seconds and severe errored seconds. The UNAVAIL SECS field is an indication of service outage based on loss of signal (LOS) or SEVRE ERRD SECS. Check the SEVRE ERRD SECS field to determine the cause of the outage. For far-end errors indicated in this report, check the far-end equipment.

FRM Port Performance Report

This report provides performance data for an FRM port.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM						
FRM PORT PERFORMANCE REPORT						
printed: 01-02-98 14:46						
Daily: 01-01-98						
reporting intervals: 10:00 - 10:59						
node: national/east/957/node10						
module: 123/12						
port: 6						
NODE	ADDR	INTERVAL	%UTIL	BYTES	FRAMES	AVERAGE
MAME	-mod		-pk rcv	-pk rcv	-pk rcv	FRAME SZ
	-port	-----	-pk xmt	-pk xmt	-pk xmt	-pk rcv
		RECEIVER	-rcv	-rcv	-rcv	-pk xmt
	----	-overuns	-xmt	-xmt	-xmt	-rcv
	SPEED	-bad frms				-xmt

national	123/12	10:00	37	5801923	6446	900
east	6	10:59	23	22725260	15130	1502
957		-----	10	22924109	15156	1499
node10	-----	0	39	12877413	8651	1488
	9600	0				

Screen 6-11. Sample FRM Port Performance Report

Report Interpretation

This report shows the performance of FRM ports. The RECEIVER-bad frms value represents the number of frames that the FRM received in the reporting interval that were faulty, i.e., frames that have one of the following problems: a non-integral number of octets, an aborted frame, or a bad frame check sequence (FCS).

When the module receives a bad frame, it discards that frame. There are three possible causes of bad frames: a faulty access device, such as a router; transmission errors on the facilities; or a faulty module. If the RECEIVER-bad frms value is high, do the following to determine the cause of the problem:

- Check the facility using the FRM Facility Performance Report.
- Check the FRM configuration to ensure that the correct maximum frame size is being used. Run on-line diagnostics on the FRM to further isolate the problem.
- Check the access device configuration to ensure that the correct maximum frame size is being used. Run diagnostics on the access device (where available) to further isolate the problem.
- Check alarm messages for further information on faulty frames.

The RECEIVER-overruns field shows the number of overruns that occurred on the port during the report interval. An overrun occurs when frames are received faster than they are stored and forwarded because the FRM processor is too busy. If the RECEIVER-overruns count is high, check the following:

- AVERAGE FRAME SZ - a small average frame size could cause high processor utilization.
- I/O board utilization - the I/O board may be too busy.
- Hardware - if the frame size is large and the %UTIL is at a reasonable number, the problem may be bad hardware. Swap hardware or run diagnostics to check.

If port or main processor utilization is high, check the AVERAGE FRAME SZ field, and if it is small, either the frame size should be increased or the amount of data decreased.

Use the %UTIL fields to determine usage of the port during the interval. In conjunction with the FRM DLCI Utilization and FRM DLCI Congestion report statistics, this information can be used to determine if additional ports should be added, or if the current configuration is adequate for the traffic conditions.

FRM DLCI Utilization Report

This report provides DLCI utilization data for an FRM module. The report can be sorted on a dlcI or interval basis.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM						
FRM DLCI UTILIZATION REPORT						
printed: 01-02-98 14:46						
Daily: 01-01-98						
reporting intervals: 10:00 - 10:59						
node: national/east/957/node 10						
module: 123/12						
port: 6						
dlci: 1001						
sort by: interval						
NODE NAME	ADDR -mod -port -dlci	INTVL	FRAMES -rcv -xmit -rej rcv -rej xmit	BYTES -rcv -xmit	FRAMES WITH DE BIT SET BY MODULE	DISCARDED FRAMES (>Bc+Be)
national	123/12	10:00	2349713	22724109	838	23
east	6	10:59	2105691	40896000		
957	1001		1345			
node10			2461			

Screen 6-12. Sample FRM DLCI Utilization Report

Report Interpretation

This report shows the DLCI usage for an FRM module and port. The DISCARDED FRAMES values indicate the number of times frames were discarded by the FRM module. Frames are discarded because the configured maximum throughput has been exceeded or because of either the unavailability of buffers or enforced congestion control. If the FRAMES-rej rcv field is high, check error counts and utilization levels along the path of the virtual circuit (particularly on trunks) and the DISCARDED FRAMES field (transmit direction) at the remote module to determine the cause of data discards. If the FRAMES-rej xmit field is high, check error counts along the path.

Use the FRAMES WITH DE BIT SET field as an indication of whether the specified throughput is adequate. In addition to frames with the DE bit set, this field counts the ingress frames that exceed Bc but did not exceed the maximum configured throughput for the DLCI, Bc+Be. If a CIR is not configured for the DLCI, this field is not applicable.

FRM DLCI Congestion Report

This report provides port congestion data for an FRM module. The report can be sorted on a dlci or interval basis.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM						
FRM DLCI CONGESTION REPORT						
printed: 01-02-98 14:46						
Daily: 01-01-98						
reporting intervals: 10:00 - 10:59						
node: national/east/957/node 10						
module: 123/12						
port: 6						
dlci: 390						
sort by: dlci						
NODE NAME	ADDR -mod -port -dlci	INTVL	FRAMES -rcv -xmit	FRAMES WITH DE BIT SET BY NETWORK -rcv -xmt	FRAMES WITH CNGST BIT SET -rcv FECN -xmt FECN -rcv BECN -xmt BECN	FRAMES DISCARDED (congestion) -rcv -xmt
national	123/12	10:00	2256820	2396	23	10
east	6	10:59	2365932	45	13	21
957	390				2145	

Screen 6-13. Sample FRM DLCI Congestion Report

Report Interpretation

This report shows congestion for an FRM module and port. The FRAMES DISCARDED field shows the number of frames discarded because of congestion, that is, insufficient buffer space or enforced congestion control. In this report, the FRAMES DISCARDED field does *not* count frames discarded because of maximum throughput considerations.

FRM-M2 Module Performance Report

This report provides module performance data for an FRM-M2 module.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM FRM-M2 MODULE PERFORMANCE REPORT printed: 01-02-98 14:46 Daily: 01-01-98 reporting intervals: 16:00 - 16:59 nodes: all module: all									
NODE NAME	ADDR -mod	INTVL	%AVG MAIN UTIL	%PEAK MAIN UTIL	PACKETS -fm node -to node	CONGEST -cnt -secs	OVERFLOWS -fm bckpl -to bckpl	ATM SEGS -fm node -to node	
national	123	16:00	57	63	431682	2	192	14	
east		16:59			8009	15	78	111	
957									
node20									
	72	16:00	30	45	32714922	0	0	0	
		16:59			4129	0	0	0	
national	22	16:00	39	61	811299	10	8	196	
east		16:59			982	30	120	41	
957									
node21									

Screen 6-14. Sample FRM-M2 Module Performance Report

Report Interpretation

This report shows the performance of FRM-M2 modules. The percentage values found in the %AVG MAIN UTIL and %PEAK MAIN UTIL fields can be used to determine if the module is being used at its full capacity. The CONGEST, PACKET, ATM SEGS, and OVERFLOWS fields give an indication of the traffic flow through the buffer and on the backplane. If these values are being used to determine if the module is overloaded or congestion, they should be used in conjunction with the DISCARDED FRAMES statistics in the FRM-M2 DLCI Utilization Report to determine if the buffer space is adequate for the traffic.

The OVERFLOWS fields give an indication of severe congestion on the module. If a high rate is reported, you may have to re-engineer the network to reduce the load on the module.

In particular, the CONGESTION field gives an indication of severe congestion and affects all ports on the module. A high CONGESTION count may mean that the network should be re-engineered to reduce the load on the module. Use the CONGESTION field in conjunction with the %AVG MAIN UTIL and % PEAK MAIN UTIL fields to determine if the module is overloaded.

FRM-M2 Port Performance Report

This report provides performance data for FRM-M2 physical ports.

<i>StarKeeper</i> (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM FRM-M2 PORT PERFORMANCE REPORT printed: 01-02-98 14:46 Daily: 01-01-98 reporting intervals: 16:00 - 16:5 nodes: all module: all ports: all									
NODE	ADDR	NEAR	NEAR	NEAR	NEAR	NEAR	NEAR	END	FAR
NAME	-mod	END	END	END	END	END	END	END	END
	-port	UN-	LINE	LINE	AIS	-Line	Errored	Seconds	
		AVAIL	CODE	SEVERE	SECS	-Code	Viol	(FE	BER if crc4)
	-----	SECS	VIOL	ERRED	-----	-Errored	Seconds		
				SECS	NEAR	-Severed	Err	Seconds	
-----	INTVL				END	-Sev	Err	Frame	Seconds
FRAME					BER6	-Frame	Slip	Seconds	
FORMAT					SECS				

national	20	0	24	28	2	91.2		98.0	
east	11					3		4	
957						409		97	
node20	-----				-----	38		8	
	16:00				0	24		5	
	16:59					8		3	
						3		4	

Screen 6-15. Sample FRM-M2 Port Performance Report

Report Interpretation

This report shows the performance of FRM-M2 *physical* ports. Use the error counters to determine if there are line problems at the physical port or far end DTF equipment. In particular, the LINE CODE VIOL field should be checked to identify the cause of near-end LINE ERRD SECS and LINE SEVERE ERRD SECS. Use the CODE VIOL field to identify the cause of facility errored seconds and severe errored seconds. The UNAVAIL SECS field is an indication of service outage based on LOS or SEVERE ERRD SECS. Check the SEVERE ERRD SECS field to determine the cause of the outage. For far-end errors indicated in this report, check the far-end equipment.

FRM-M2 Virtual Port Performance Report

This report provides performance data for FRM-M2 virtual ports.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM FRM-M2 VIRTUAL PORT PERFORMANCE REPORT printed: 01-02-98 14:46 Daily: 01-01-98 reporting intervals: 10:00 - 10:59 node: national/east/957/node10 module: 123 port: 6 vport: 12							
NODE	ADDR	INTERVAL	%UTIL	BYTES	FRAMES	AVERAGE	CONGEST
MAME	-mod		-pk rcv	-pk rcv	-pk rcv	FRAME SZ	-rcv cnt
	-port	-----	-pk xmt	-pk xmt	-pk xmt	-pk rcv	-xmt cnt
	-vport	RECEIVER	-rcv	-rcv	-rcv	-pk xmt	-rcv secs
	-----	-overuns	-xmt	-xmt	-xmt	-rcv	-xmt secs
	SPEED	-bad frms				-xmt	

national	123	10:00	63	9613928	1924362	900	0
east	6	10:59	81	2481119	892119	1502	0
957	12	-----	57	892003	3224681	1399	0
node10	-----	0	74	241026	540004	1277	0
	9600	0					

Screen 6-16. Sample FRM-M2 Virtual Port Performance Report

Report Interpretation

This report shows the performance of FRM-M2 *virtual* ports. The RECEIVER-bad frms value represents the number of frames that the FRM-M2 received in the reporting interval that were faulty, i.e., frames that have one of the following problems: a non-integral number of octets, an aborted frame, or a bad FCS.

When the module receives a bad frame, it discards that frame. There are three possible causes of bad frames: a faulty access device, such as a router, transmission errors on the facilities, or a faulty module. If the RECEIVER-bad frms value is high, do the following to determine the cause of the problem:

- Check the facility using the FRM-M2 Physical Port Performance Report.
- Check the FRM-M2 configuration to ensure that the correct maximum frame size is being used. Run on-line diagnostics on the FRM-M2 to further isolate the problem.

- Check the access device configuration to ensure that the correct maximum frame size is being used. Run diagnostics on the access device (where available) to further isolate the problem.
- Check alarm messages for further information on faulty frames.

The RECEIVER-overruns field shows the number of overruns that occurred on the port during the report interval. An overrun occurs when frames are received faster than they are stored and forwarded because the FRM-M2 processor is too busy. If the RECEIVER-overruns count is high, check the following:

- AVERAGE FRAME SZ - a small average frame size could cause high processor utilization.
- I/O board utilization - the I/O board may be too busy.
- Hardware - if the frame size is large and the %UTIL is at a reasonable number, the problem may be bad hardware. Swap hardware or run diagnostics to check.

The CONGESTION field is an indication of severe congestion and may affect all ports (physical and virtual) on the module. Transmitter congestion usually indicates a speed mismatch (more data entering from the backplane than can be transmitted through the port). In this case, the port speed should be increased. Use the CONGESTION field in conjunction with the %UTIL field to determine usage if the virtual port is overloaded.

FRM-M2 DLCI Utilization Report

This report provides port utilization data for an FRM-M2 module. The report can be sorted on a dlcI or interval basis.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM FRM-M2 DLCI UTILIZATION REPORT printed: 01-02-98 14:46 Daily: 01-01-98 reporting intervals: 10:00 - 10:59 node: national/east/957/node 10 module: 123 port: 6 vport: 12 dlcI: 1001 sort by: interval						
NODE NAME	ADDR -mod -port -vport -dlci	INTVL	FRAMES -rcv -xmit	BYTES -rcv -xmit	FRAMES WITH DE BIT SET BY MODULE	DISCARDED FRAMES - >Bc+Be - By Network
national	123	10:00	2339871	22724109	877	23
east	6	10:59	2104468	40896000		15
957	12					
node10	1001					

Screen 6-17. Sample FRM-M2 DLCI Utilization Report

Report Interpretation

This report shows the DLCI congestion for an FRM-M2 module and port. The DISCARDED FRAMES values indicate the number of times frames were discarded by the FRM-M2 module. Frames are discarded because the configured maximum throughput has been exceeded or because of either the unavailability of buffers or enforced congestion control. These numbers can indicate an overloaded or congested module, port, or virtual circuit. Use these numbers in conjunction with traffic count statistics in the FRAMES and BYTES fields, along with the statistics in the FRM-M2 DLCI Congestion report and the FRM-M2 Port and Virtual Port Performance reports to determine if the module or port is overloaded or congested.

Use the FRAMES WITH DE BIT SET field as an indication of whether the specified throughput is adequate. In addition to frames with the DE bit set, this field counts the ingress frames that exceed Bc but did not exceed the maximum configured throughput for the DLCI, Bc+Be. If a CIR is not configured for the DLCI, this field is not applicable.

If the DISCARDED FRAMES - by Network field is high, check error counts at the remote module and along the path of the virtual circuit to determine the cause of the data discards.

FRM-M2 DLCI Congestion Report

This report provides port congestion data for an FRM-M2 module. The report can be sorted on a dlci or interval basis.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM						
FRM-M2 DLCI CONGESTION REPORT						
printed: 01-02-98 14:46						
Daily: 01-01-98						
reporting intervals: 10:00 - 10:59						
node: national/east/957/node 10						
module: 123						
port: 6						
vport: 12						
dlci: 142						
sort by: dlci						
NODE NAME	ADDR	INTVL	FRAMES	FRAMES WITH DE BIT SET BY NETWORK	FRAMES WITH CNGST BIT SET	FRAMES DISCARDED (congestion)
	-mod		-rcv	-rcv	-rcv FECN	-rcv
	-port		-xmit	-xmt	-xmt FECN	-xxmt
	-vport				-rcv BECN	
	-dlci			-xmt	-xmt BECN	

national	123	10:00	15156	2396	23	10
east	6	10:59	8651	47	13	25
957	12				2445	
node10	142				27	

Screen 6-18. Sample FRM-M2 DLCI Congestion Report

Report Interpretation

This report shows the congestion for an FRM-M2 module and port. The FRAMES DISCARDED field shows the number of frames discarded because of congestion, that is, insufficient buffer space or enforced congestion control. In this report, the FRAMES DISCARDED field does *not* count frames discarded because of maximum throughput considerations.

Host Access Report

Host Access Reports show connection data for each specified receiving group or two-way group. A *receiving group* contains the devices that only *receive* calls (for instance, ports or channels that connect to a host dial-out modem, or a printer). A *two-way group* can both receive and originate calls (for instance, a PC, a modem, or a host computer). It is called the *Host Access Report* because the most common use of the report is to display the number of calls going out from a node to a host computer. However, the report applies to all receiving groups, whether they access a host or not. Reports are available on a daily, weekly, or monthly basis. The example below is a monthly report. You can also request peak or average data or both; the example below shows the result of choosing both.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM										
HOST ACCESS REPORT										
printed: 01-02-98 14:46										
daily: 01-01-98										
reporting intervals: 00:00 - 11:59										
interval length: 1-hour										
node type: BNS-2000										
receiving groups: all										
NET/DNIC	RECV	REPORT	PEAK	% PORT	CALL	FAILS	FAILS	FAILS	FAILS	
AREA/SR	GROUP	INTRVL	CONN	UTIL	ATTMPT	TOTAL	CONT	SEC	OTHER	
EXCH/SA										
NODE										

national	gchecker	10:00	69	15	70	0	0	0	0	0
east			(19)	(15)	(20)	(0)	(0)	(0)	(0)	(0)
957										
node20										

		11:00	169	15	90	0	0	0	0	0
			(39)	(15)	(33)	(0)	(0)	(0)	(0)	(0)

Screen 6-19. Sample Host Access Report (Monthly)

Report Interpretation

The report is sorted in this order: first, by node name; second, by group name; and third, by reporting interval. You want to determine if the receiving groups are set up in the node in an optimal way; that is, to see if the number of ports assigned to a group is optimal. Determine port usage by reviewing the % PORT UTIL field. Ideally, % PORT UTIL is high and there are no failed attempts. A low percentage may indicate that too many ports are assigned to that group. High values in the FAILS CONT field indicate that not enough ports were assigned to that group. There may be accompanying end user response time delays as the number of call attempts may be higher along with the number of failures due to contention. All failed connection attempts are reported. FAILS SEC must be monitored to determine whether attempts to breach network security are being made.

If the FAILS OTHER field is high, check to see if components are out of service, if there are network failures, or if the routing tables are correct. Resolving these problems should reduce the failures in this field.

Multiplexer Module Usage Report

This report shows the usage and performance of the link that connects a Synchronous/ Asynchronous Multiplexer (SAM64 and SAM504) to the node. Measurements are from the Link Interface Module (LIM) on the node backplane.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM											
MULTIPLEXER MODULE USAGE REPORT											
printed: 01-02-98 14:46											
daily: 01-01-98											
reporting intervals: 00:00 - 11:59											
interval length: 1-hour											
node type:BNS-2000											
nodes: all											
<-----FROM DK-----> <-----TO DK----->											
MOD TYPE	REPT	MOD #	TOTAL	%	%	TOTAL	%	%	TO DK	FROM	
TRK TYPE	INTVL		BYTES	TRK	PEAK	BYTES	TRK	PEAK	RETRAN	DK	
				UTIL	UTIL		UTIL	UTIL		ERRS	
SAM/64	9:00	11.4	2529	1	2	2386	4	5	6	7	
SAMML	9:59										
	10:00	11.4	21529	11	21	21386	41	51	1	2	
	10:59										

Screen 6-20. Sample SAM Multiplexer Module Usage Report

Report Interpretation

This report is similar to the Trunk Usage Report and Concentrator Module Usage Report. The key fields are % TRK UTIL and % PEAK UTIL, which represent how much of the physical link is being used. A general guideline is that average link utilization should not exceed 70%.

The error counts indicate the health of the link module in the node backplane. Increased error counts may indicate problems in the link module or the physical link. Error counts may or not be related to the utilization. For example, high usage and several errors can indicate that the link module is retransmitting and thereby creating traffic.

If a value in the % UTIL field cannot be explained by usage or errors, it is possible that the configuration information (particularly the link speed) was entered incorrectly in the database. The report uses the speed of the link from the database in its calculations.

Multiplexer Port Usage Report (Daily)

This report provides port usage information for Asynchronous Multiplexers (AMUX64/504) and Synchronous/Asynchronous Multiplexers (SAM64/SAM504). Reports are available on a module or port basis; measurements can be scheduled for every hour or every six hours. Below is a sample daily multiplexer port usage report.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM MULTIPLEXER PORT USAGE REPORT printed: 01-02-98 14:46 daily: 01-01-98 reporting intervals: 00:00 - 11:59 interval length: 1-hour node type: BNS-2000 nodes: all modules: all boards: all								
NET/DNIC	MOD TYPE	REPT	TO DK	FROM DK	TO DK	FROM DK	USART	
AREA/SR	MOD ADDR	INTVL	TRAFFIC	TRAFFIC	RETRANS	ERRORS	ERRORS	
EXCH/SA								
NODE								

national	AMUX/64	9:00	1115	1115	0	0	0	
west	18/2.3	9:59						
957								
node20								

		10:00	1955	778	0	0	0	
		10:59						

		11:00	1454	744	0	0	0	
		11:59						

Screen 6-21. Sample Daily SAM Multiplexer Port Usage Report

Report Interpretation

This report shows the usage and performance of the ports on the multiplexer boards. These ports, on TERM32 boards, are connected to lines leading out to user endpoints. Traffic is measured in "number of intervals"; one interval equals 3.2 seconds.

This report is useful in troubleshooting endpoint problems, since it shows the traffic and errors for the line side of the ports. Each port can have a speed associated with it, but that information is not available for reporting. Therefore, there is no % UTIL field calculated for the ports and no one key field on which to focus.

A trouble can be caused by a faulty TERM32 board, a port, or the line leading out of the port. To troubleshoot, look for an atypical combination of traffic and error counts. High traffic coupled with high error counts can indicate a TERM32 board or port problem, causing traffic to be retransmitted. Use the node **verify sam** command to check the speed of the ports, if necessary.

Network Availability Report

This report is divided into two subreports: the Node Availability Report and the Trunk Availability Report. Together they give the administrator a broad overview of network availability to *StarKeeper* II NMS. The most significant item is the percent availability of each of these entities, the node and the trunk.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM NETWORK REPORT: NODE AVAILABILITY printed: 01-02-98 14:46 daily: 01-01-98 nodes: all	
NODE	AVAILABILITY (%)
national/west/957/aneu1	100.0
national/west/957/node20	75.0

Screen 6-22. Sample Node Availability Report

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM NETWORK REPORT: TRUNK AVAILABILITY printed: 01-02-98 14:46 daily: 01-01-98 trunks: all			
TRUNK NAME	TRUNK TYPE	NODE1 NODE2	AVAILABILITY (%)
raf3	DDS	national/west/garden/node22 national/west/garden/node21	100.0
raf1	HS	national/west/garden/node20 national/west/garden/node22	75.0

Screen 6-23. Sample Trunk Availability Report

Report Interpretation

Ideally, availability should be 100%. Perhaps low percentages are caused by equipment failures. For nodes, look for low availability percentages and determine whether the problem is with the node, the connection from the node to *StarKeeper* II NMS or *StarKeeper* II NMS itself. For trunks, look for low availability percentages and determine whether the problem is with either trunk module or with the facility itself.

An availability percentage of 75 percent means a downtime of 25 percent. Node downtime is the time the node is not available to *StarKeeper* II NMS because it is disconnected or made inactive (using the **cfchange** command). Trunk downtime is the time the trunk is down during the corresponding node connect time.

Node Usage Report

This report summarizes trunk group and receiving group usage per node for the specified time period (daily, weekly, or monthly). The number of peak connections and call attempts is given on a per-node basis for each report interval.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM			
NODE USAGE REPORT			
printed: 01-02-98 14:46			
daily: 01-01-98			
reporting intervals: 00:00 - 11:59			
interval length: 1-hour			
node type: BNS-2000			
nodes: all			
NODE NAME	REPORT INTERVAL	PEAK CONNECTIONS	CALL ATTEMPTS
national/west/957/node20	10:00	41	71
national/west/957/node20	11:00	80	18
national/west/957/node20	12:00	61	117
national/west/957/node20	13:00	63	132
national/west/957/node20	15:00	38	57
national/west/957/node20	16:00	76	139
national/west/957/node20	17:00	58	72

Screen 6-24. Sample Node Usage Report (Daily)

Report Interpretation

This report depicts the local connections established through the nodes for all types of calls—both switched and non-switched. It is similar to the Host Access Report and Trunk Group Availability Reports except that it *summarizes* the connections for all receiving groups and trunks on the node. The report is useful to review the distribution of connections over the individual nodes. The results should be compared against how the network was originally engineered (for example, which nodes were expected to handle more local connections) to determine if the balance of traffic needs to be changed. Note that the PEAK CONN field in this report will not be the sum of the Host Access Report and Trunk Group Availability Report peak connections, since this report is a snapshot of the overall local node traffic.

SAMML Module Performance Report

This report provides performance data for a SAM Multiport-Link (SAMML). Reports are available on a module or port basis, and at a frequency of daily, weekly, or monthly. Below is a sample *daily* SAMML module performance report. (The next section describes the SAMML port performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM SAMML MODULE PERFORMANCE REPORT printed: 01-02-98 14:46 daily: 01-01-98 reporting intervals: 00:00 - 11:59 interval length: 1-hour node type: BNS-2000 nodes: all modules: all								
NET/DNIC AREA/SR EXCH/SA NODE	MODULE ADDRESS	REPT INTVL	% IDLE	% MIN IDLE	PACKETS RECEIVED	PACKETS TRANSMITTED	PARITY ERRORS	CHANNEL ERRORS
national	5	9:00	98	99	8	36	0	0
west		9:59						
957								
node20								
		10:00	98	99	283	663	0	0
		10:59						
		11:00	98	99	1082	363	0	0
		11:59						

Screen 6-25. Sample Daily SAMML Module Performance Report

Report Interpretation

For weekly and monthly reports you can request peak values and/or averages. If both are requested, the peaks are listed first and the averages are shown in parentheses under the peaks.

A high number in the idle columns means that the module was not utilized much, so the administrator can increase the module load. But the idle number should not be in the teens either, which indicates a load that is too heavy. Low parity errors indicate a healthy system. A parity error may be caused by faulty hardware in the node or inserting a circuit pack in the backplane. Channel errors also should be low. High channel errors would indicate a facility problem in the equipment the node is trying to reach.

SAMML Port Performance Report

This report provides performance data for the ports of a SAM Multiport-Link (SAMML). Reports are available on a module or port basis; below are two sample, daily SAMML port performance reports. The first is sorted by module address and the second is sorted by report interval. (The previous section describes the SAMML module performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM										
SAMML PORT PERFORMANCE REPORT										
printed: 01-02-98 14:46										
daily: 01-01-98										
reporting intervals: 00:00 - 11:59										
interval length: 1-hour										
node type: BNS-2000										
nodes: all										
modules: 3										
ports: all										
sort: address										
MOD	REPT	PORT	PORT	TOTAL	TOTAL	OVHD	OVHD	CRC	ABORT	
ADDR.	INTVL	UTIL	UTIL	BYTES	BYTES	BYTES	BYTES	ERRORS	RCVD	
PORT/		REC	TRANS	RECEIVED	TRANSMITTED	REC	TRANS			
SPEED		%	%			%	%			

123.1	11:00	95	90	123456789	123456789	10	10	12345		0
9600	11:59									

Screen 6-26. Sample SAMML Port Performance Report (Module Address)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM										
SAMML PORT PERFORMANCE REPORT										
printed: 01-02-98 14:46										
daily: 01-01-98										
reporting intervals: 00:00 - 11:59										
interval length: 1-hour										
node type: BNS-2000										
nodes: all										
modules: 3										
ports: all										
sort: interval										
MOD	REPT	PORT	PORT	TOTAL	TOTAL	OVHD	OVHD	CRC	ABORT	
ADDR.	INTVL	UTIL	UTIL	BYTES	BYTES	BYTES	BYTES	ERRORS	RCVD	
PORT/		REC	TRANS	RECEIVED	TRANSMITTED	REC	TRANS			
SPEED		%	%			%	%			

123.1	11:00	95	90	123456789	123456789	10	10	12345		0
9600	11:59									

Screen 6-27. Sample SAMML Port Performance Report (Report Interval)

Report Interpretation

This report shows the usage and performance of the SAMML ports in relation to the user endpoints.

A high percentage value in the PORT UTIL fields, either transmitted or received, means that there is heavy traffic across the line. If it is above 95%, and there are no errors, traffic should be offloaded and more ports should be added. If the number is low (like 10–20%), that traffic can be moved somewhere else where PORT UTIL is also low thus freeing up the port. Values in the OVHD BYTES column should be low. If this number is too high (like 50% or more) it means that only 50% of the data is actually transmitted or received. OVHD BYTES are included in the calculations for PORT UTIL. CRC error values also should be low. CRC error is flagged every time there is an error in transmission of data. If this error is flagged, the data is sometimes retransmitted or received with the errors depending on the particular application.

For nodes, this report can be compared to the Multiplexer Module Usage Report for SAMML-connected SAMs. The SAMML Port Performance Report shows usage and errors from the perspective of the port on the node. The Multiplexer Module Usage Report shows usage and errors from the perspective of the LIM in the SAM.

SDLC8 Module Performance Report

This report provides module-level usage and performance measurements for a Synchronous Data Link Control (SDLC8). The first columns (% BUSY, FROM NODE PACKETS, and TO NODE PACKETS) show the usage of the module and the last columns (FIFO INTRPT, BUFFER NOT AVAIL) show the performance of the module. Usage is a measure of traffic, and performance is a measure of errors.

Reports are available on a module or port basis, and at a frequency of daily, weekly, or monthly. Below is a sample *daily* SDLC8 *module* performance report. (The next section describes the SDLC8 *port* performance report.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM							
SDLC8 MODULE PERFORMANCE REPORT							
printed: 01-02-98 14:46							
daily: 01-01-98							
reporting intervals: 00:00 - 11:59							
node type: BNS-2000							
nodes: all							
modules: all							
NET/DNIC	MODULE	REPT	%	FROM NODE	TO NODE	FIFO	BUFFER
AREA/SR	ADDR	INTVL	BUSY	PACKETS	PACKETS	INTRPT	NOT
EXCH/SA							AVAIL
NODE							

national	17	9:00	1%	88	36	0	0
west		9:59					
957							
node20							

Screen 6-28. Sample Daily SDLC8 Module Performance Report

Report Interpretation

The SDLC8 module can appear in a remote shelf as well as in the node backplane. For weekly and monthly reports you can request peak values and/or averages. If both are requested, the peaks are listed first and the averages are shown in parentheses under the peaks.

Usage and performance measurements for a module may or may not be related. Usage is a measure of the traffic and performance is a measure of errors—usually hardware related. These two types of measurements can complement each other. For example, high usage and several errors can indicate a module that is retransmitting and thereby creating traffic.

The report shows the usage and performance of the SDLC8 module in relation to the node backplane. Use the report to help troubleshoot problems that are detected in other reports, such as port utilization reports. For example, problems with port utilization could be caused by an overworked (high usage or too much traffic) module. This report is also useful for monitoring the performance of newly installed or suspect SDLC8 modules.

The % BUSY value can be high with no adverse affect on performance. The error counts, however, do indicate problems between the module and the backplane. Those problems could be too much traffic for the module, given its location and the node it is in; or a malfunctioning module. FIFO INTRPT indicates that the module is getting too busy. BUFFER NOT AVAIL may indicate incoming traffic is exceeding the capacity of the module.

SDLC8 Port Performance Report

This report provides port-level usage and performance measurements for Synchronous Data Link Control (SDLC8) modules. The first column (TOTAL BYTES, in each direction) shows the usage of the port. The last columns (RCVR OVRUN, RCVR ABORTS, BAD FCS, TOTAL TRANS UNDRUN) show the performance of the port and/or wire.

Below is a sample, daily SDLC8 *port* performance report sorted by port address; it is also available sorted by report interval. (The previous section describes the SDLC8 *module* performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM											
SDLC8 PORT PERFORMANCE REPORT											
printed: 01-02-98 14:46											
daily: 01-01-98											
reporting intervals: 00:00 - 11:59											
node type:BNS-2000											
nodes: all											
modules: all											
sort:address											
NET/DNIC	MOD	PORT	REPT	%UTIL	TOTAL	BYTES	RCVR	RCVR	BAD	TOTAL	
AREA/SR	PORT	SPEED	INTVL	-recv	-recv		OVRUN	ABORTS	FCS	TRANS	
EXCH/SA				-trans	-trans					UNDRUN	
NODE											
national	22	9600	0:00	R 17	R	747200	173	34	67	121	
west	1		0:59	T 22	T	947201					
957											
node20											
			1:00	R 2	R	73692	42	7	29	41	
			1:59	T 6	T	247720					
			2:00	R 1	R	39791	53	13	24	43	
			2:59	T 8	T	345691					

Screen 6-29. Sample SDLC8 Port Performance Report (Port Address)

Report Interpretation

This report shows the usage and performance of the SDLC8 ports in relation to the user endpoints. The purpose of this report is to help identify and troubleshoot problems. For example, an underutilized port could be caused by too much traffic coming in from all ports on that module. This report can also be used to identify problems with the transmission facility (for example, a wire). For example, RCVR ABORTS can be due to noise on the wire or to the remote end being overloaded. TOTAL TRANS UNDRUN indicates a burst of traffic coming in to the module as a whole, exceeding the USART capacity of the module. BAD FCS indicates problems with the traffic coming into the port—due either to the end devices or transmission facility.

The error counts (receiver CRC and overrun) indicate the health of the trunk module and the physical trunk. Increased error counts may indicate problems in the trunk module or the physical trunk.

If the % UTIL column shows 1% and there is no traffic (byte counts are 0), interpret the 1% as N/A. This means there is no data available for the trunk module during that interval (for example, not in service or measurements not scheduled).

Trunk Group Availability Report

This report presents information on trunk group usage and access measurements. It is similar to the Host Access Report, and may be used for the same purpose. This report sorts trunk groups by node name, group name, and report interval, respectively.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM								
TRUNK GROUP AVAILABILITY REPORT								
printed: 01-02-98 14:46								
daily: 01-01-98								
reporting intervals: 00:00 - 11:59								
interval length: 1-hour								
node type: BNS-2000								
trunks groups: all								
NET/DNIC AREA/SR EXCH/SA NODE	GROUP NAME	REPORT INTERVAL	PEAK CONNECTS	% CHAN UTIL	CONNECT ATTEMPTS	FAILS CONT	FAILS OTHER	
national east 957 node20	gt8nk1s0	16:00	14 (9)	11 (6)	22 (15)	0 (0)	12 (8)	
national east 957 node20	gtrklc16	12:00	21	17	3	0	0	
national east 957 node20	gtrnktoy	12:00	17	6	66	0	22	

Screen 6-30. Sample Trunk Group Availability Report

Report Interpretation

This report depicts the connections established through the node by a trunk group. A trunk group is one or more physical trunks. Trunk group connections are destined for another node and are not considered local connections. This report is similar to the Host Access Report; but instead of showing connections by receiving group, this report shows connections by trunk group.

The primary purpose of this report is to display the number of inter-nodal calls going through the node, by trunk group. The term *trunk group availability* refers to the utilization of channels within the trunk group. A trunk group is available to route traffic to another node only if there is an available channel on one of its physical trunks. Ideally, % CHAN UTIL is high and there are no failed attempts.

Trunk Usage (DDS/64)

This report provides information for Digital Data Service (DDS) trunk usage and various trunk performance measurements. It is very sensitive to correct user input on trunk configuration in the configuration database. The data are sorted first by trunk type, end node name, trunk name, and finally by report interval.

Refer to the next report heading for the trunk usage report for other types of trunks.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM DDS/64 TRUNK USAGE REPORT printed: 01-02-98 14:46 daily: 01-01-98 reporting intervals: 00:00 - 11:59 interval length: 1-hour node type: BNS-2000 trunks: all									
NAME TYPE SPEED	NET/DNIC AREA/SR EXCH/SA NODE	REPT INTVL	% UTIL -recv -trans	TO NODE BYTES	FROM NODE BYTES	%OVHD BYTE	RCVR CRC	RCVR OVRN	
trk4	node20	11:00	40	429765	809762	6	2	0	
DDS			72						
56k									
trk5	node20	09:00	31	329365	569756	3	0	0	
DDS			52						
56k									

Screen 6-31. Sample Trunk Usage Report

Report Interpretation

This report depicts the traffic and performance of DDS/64 trunk modules. It is based on node trunk measurements, which contain much more detail (for example, packet counts, errors) than this report. For an in-depth analysis of current trunk measurements, use the node **dmeas trunk** command.

Since each node reports on only one end of the trunk, it is important to look at both nodes and both trunk modules for a complete picture of trunk performance. Perhaps the most important field is the % UTIL, since it represents how much of the physical trunk is being used, as measured by the trunk module at one end. A general guideline is that the average trunk utilization should not exceed 70%. If % UTIL is unexpectedly high or low, check the administered speed. The value used here is based on what is in the configuration database and not necessarily the actual trunk capacity.

Trunk Usage Report (non-DDS)

This report provides information about trunk usage and various trunk performance measurements. It is very sensitive to correct user input on trunk configuration in the configuration database. The data are sorted first by end node name, then by trunk name, and finally by report interval. Measurements for HS, T1, SFT, and SWT trunks are for the internodal connections only; measurements for HS, T1, SFT, and SWT trunks used to link a SAM/504 or SAM/64 to a node are contained in the Multiplexer Module Measurements report.

Refer to the preceding report for a description of the DDS/64 Trunk Usage Report.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM								
TRUNK USAGE REPORT								
printed: 01-02-98 14:46								
daily: 01-01-98								
reporting intervals: 00:00 - 11:59								
interval length: 1-hour								
node type: BNS-2000								
trunks: all								
NAME	GROUP	NET/DNIC	MOD	REPT	% UTIL	TO NODE	FROM NODE	PAR ERR
TYPE		AREA/SR	ADD	INTV	-recv	PACKETS	PACKETS	
SPEED		EXCH/SA			-trans			
		NODE						
raf1	HStrk001	node20	1	16:00	00	123456789	987654321	395
HS				16:59	00			
8.0 Mb/s								
raf10	HStrk003	node20	10	16:00	100	*****	*****	858395
HS				16:59	100			
8.0 Mb/s								
raf11	HStrk003	node20	11	16:00	4	N/A	N/A	123456
HS				16:59	9			
8.0 Mb/s				16:59	9			

Screen 6-32. Sample Trunk Usage Report

Report Interpretation

This report depicts traffic and performance of non-DDS trunk modules and is based on node trunk measurements, which contain more detail (for example, packet counts, errors) than this report. For an in-depth analysis of current trunk measurements, use the node **dmeas trunk** command.

Since each node reports on only one end of the trunk, it is important to look at both nodes and both trunk modules for a complete picture of trunk performance. Perhaps the most important field is the % UTIL, since it represents how much of the physical trunk is being used, as measured by the trunk module at one end. A general guideline is that the average trunk utilization should not exceed 70%. If % UTIL is unexpectedly high or low, check the administered speed. The value used here is based on what is in the configuration database and not necessarily the actual trunk capacity. If the % UTIL column shows 1% and there is no traffic (byte counts are 0), interpret the 1% as N/A. This means there is no data available for the trunk module during that interval (for example, not in service or measurements not scheduled).

The parity error counts indicate the health of the trunk module. Increased parity error counts may indicate problems in the trunk module or the physical trunk.

TSM8 Module Performance Report

This report provides performance data for a Transparent Synchronous Module (TSM8). Reports are available on a module or port basis; below is a sample daily TSM8 *module* performance report. (The next section describes the TSM8 *port* performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM									
TSM8 MODULE PERFORMANCE REPORT									
printed: 01-02-98 14:46									
daily: 01-01-98									
reporting intervals: 00:00 - 11:59									
interval length: 1-hour									
node type: BNS-2000									
nodes: all									
modules: all									
NET/DNIC AREA/SR EXCH/SA NODE	MODULE ADDRESS	REPT INTVL	IDLE	MIN IDLE	PACKETS FROM BUS	PACKETS TO BUS	FIFO INTRPT	BUFFER NOT AVAIL	
national	5	9:00	98%	99%	8	36	0	0	
west		9:59							
957									
node20									
		10:00	98%	99%	8	36	0	0	
		10:59							

Screen 6-33. Sample Daily TSM8 Module Performance Report

Report Interpretation

The TSM8 module can appear in a remote shelf as well as in the node backplane. When the module appears in a remote shelf, the module address of the measurement report is the two-level concentrator address (for example, 25/4) instead of the usual single backplane slot number (for example, 9).

Usage and performance measurements for a module may or may not be related. Usage is a measure of the traffic and performance is a measure of errors—usually hardware related. These two types of measures can complement each other. For example, high usage and several errors can indicate a module is retransmitting and thereby creating traffic.

This report shows the usage and performance of the TSM8 module in relation to the node backplane. The purpose of this report is to help troubleshoot problems that are detected in other reports, such as port utilization reports. For example, problems with port utilization could be caused by an overworked module. This report is also useful for monitoring the performance of newly installed or suspect TMS8 modules.

The % IDLE and % MIN IDLE values can be high with no adverse affect on performance. The error counts, however, do indicate problems between the module and the backplane. Those problems could be too much traffic for the module, given its location and the node it is in; or a malfunctioning module. FIFO INTRPT indicates that the module is getting too busy. BUFFER NOT AVAIL may indicate that incoming traffic is exceeding the capacity of the module.

TSM8 Port Performance Report

This report provides performance data for a Transparent Synchronous Module (TSM8). Reports are available on a module or port basis; below is a sample daily TSM8 *port* performance report sorted by module address. The report can also be sorted by report interval. (The previous section describes the TSM8 *module* performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM										
TSM8 PORT PERFORMANCE REPORT										
printed: 01-02-98 14:46										
daily: 01-01-98										
reporting intervals: 00:00 - 11:59										
interval length: 1-hour										
node type: BNS-2000										
nodes: all										
modules: all										
sort: address										
MODULE ADDR PORT	REPT INTVL	UTIL	TOTAL BYTES TRANSMIT	TOTAL BYTES RECEIVED	TOTAL RCVR OVRUN	TOTAL RCVR ABORTS	CRC ERROR RCVD	TRANS UNDRUN PIPELN	TRANS UNDRUN OTHER	
4	11:00	70%	114310	520	10	1	0	0	0	
1	11:59									
4	11:00	80%	115200	72850	200	0	0	0	0	
2	11:59									

Screen 6-34. Sample TSM8 Port Performance Report (Module Address)

Report Interpretation

This report shows the usage and performance of the TSM8 ports in relation to the user endpoints. The purpose of this report is to help identify and troubleshoot line problems. A line problem can be caused by a faulty transmission facility (for example, a wire) but it could also be caused by too much traffic coming in from all ports on that module, resulting in an underutilized port. Line problems could also be caused by administering the wrong port speed in the database.

The key field in this report is the % UTIL for the port. Port utilization is similar to trunk utilization. The port utilization is the average value for that interval, and it is calculated by dividing the traffic by the capacity. A general guideline is that average port utilization should not exceed 70%, not because of the port itself but because of the transmission facility to which it is connected. An average below 70% means that the peak utilization will be safely under 100%.

RCVR OVRUN indicates either a problem with the wire to the port, a traffic load greater than the whole module can handle, or a mismatch in speed. RCVR ABORTS indicate either noise on the line or an overloaded remote end. TOTAL TRANS UNDRUN indicate a burst of traffic coming in to the module as a whole, exceeding the module's USART capacity.

Lower level data (for example, URP measurements) are stored in the database and can be accessed via INFORMIX, if necessary. Refer to the section titled **Producing Custom Reports** later in this chapter for a complete discussion.

X.25 Module Performance Report

This report provides performance information for X.25 modules. An example of the report is shown below. Significant items include the numbers of packets to and from the node, the idle time (percentage) for each module, and the utilization of each port.

Datakit II VCS nodes R2.0 (and later) and BNS-2000 nodes have one type of module (the X.25) for all X.25 connections. (*Datakit II* VCS nodes prior to R2.0 have separate modules and, therefore, separate reports for X.25 host and PDN connections; they are shown on the following pages.) X.25 performance reports, whether pre-R2.0 or not, are very similar in format and presentation.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM										
X.25 MODULE PERFORMANCE REPORT										
printed: 01-02-98 14:46										
daily: 01-01-98										
reporting intervals: 00:00 - 11:59										
node type: BNS-2000										
nodes: all										
NET/DNIC	MODULE	REPORT	IDLE	PKTS	PKTS	PORT	%UTIL	ABNORM	BUFFERS	
AREA/SR	ADDR	INTRVL	(%)	FROM	TO		-recv	TERM	NOT	
EXCH/SA				DK	DK		-trans		AVAIL	
NODE										
national	6	13:00	60	50069	345678				45	
west										
957										
node20										
						1	40	89	42	
						2	40	89	42	

Screen 6-35. Sample X.25 Module Performance Report

Report Interpretation

The information content and fields of this performance report are similar to those for bisynchronous modules.

In BNS-2000 or BNS-2000 VCS networks, the X.25 module can be in a remote shelf as well as in the node backplane. When the module appears in a remote shelf, the module address of the measurement report is the two-level concentrator address instead of the usual single backplane slot number. The modules can be either *full duplex* or *half duplex*.

X.25 PDN Usage Report

This report provides usage information for X.25 PDN modules. Significant items include the numbers of user bytes and frame bytes received from and transmitted to the port, the number of X.25 channels in service, and the numbers of calls attempted, and accepted.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM						
X.25 PDN USAGE						
printed: 01-02-98 14:46						
daily: 01-01-98						
reporting intervals: 00:00 - 11:59						
node type:BNS-2000						
nodes: all						
NET/DNIC AREA/SR EXCH/SA NODE	MODULE ADDR	REPORT INTRVL	USER BYTES FRAME BYTES	AVERAGE CALLS	CHANNELS IN SRVCE	CALLS ACCPT CALLS ATTMP
national	6	15:00	695603	39	100	95689
west	1		5870492			123937
957						
node20						
national	6	16:00	695603	39	80	95689
west	1		5870492			123937
957						
node20						

Screen 6-36. Sample X.25 PDN Usage Report

Report Interpretation

This report shows the usage of channels connected to a Public Data Network (PDN). For a given port on an X.25 module, it shows the connections made to and from the data network. The number of user and frame bytes is a measure of the total traffic going across the channels during the hourly interval.

If the number of frame bytes is higher than usual relative to the user bytes, it could indicate corruption of the line or a protocol problem.

The last three columns depict the calls or connections during the hourly interval. Average calls is the average number of simultaneous calls during the hour. Its value cannot exceed the number of channels in service during the hour. The average calls divided by the channels in service shows the usage of the logical resource during the hour. The highest number of average calls corresponds to the busy hour for connections to the data network. If the number of average calls is too low for all hours, then fewer channels can handle the traffic.

Calls accepted divided by call attempts is the call success rate. This should be a high number. Failed calls could be the result of congestion, indicating that more logical channels are needed to handle the calls. This should also be reflected in increased channel usage. A high failure rate and low channel usage, however, may indicate an inherent problem with the line, port, or module.

X.25 Usage Report

This report provides usage information for X.25 modules. An example of the report is shown below. All nodes have one type of module (the X.25) for all X.25 connections.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM X.25 USAGE printed: 01-02-98 14:46 daily: 01-01-98 reporting intervals: 00:00 - 11:59 node type:BNS-2000 nodes: all						
NET/DNIC AREA/SR EXCH/SA NODE	MODULE ADDR	REPORT INTRVL	USER BYTES FRAME BYTES	AVERAGE CALLS	CHANNELS IN SRVCE	CALLS ACCT CALLS ATTMP
national	6	13:00	695603	39	100	95689
west	1		5870492			123937
957						
node20						
national	6	13:00	695603	39	80	95689
west	2		5870492			123937
957						
node20						
national	28	13:00	695603	39	76	95689
west	1		5870492			123937
957						
node20						

Screen 6-37. Sample X.25 Usage Report

Report Interpretation

This report provides usage information for X.25 modules. Significant items include the numbers of user bytes and frame bytes received from and transmitted to the port, the number of X.25 channels in service, number of calls attempted, and the number of calls accepted.

X.75 Module Performance Report

This report provides performance data for an X.75 module. Reports are available on a module performance or port utilization or port performance basis; below is a sample X.75 *module* performance report. (The next two sections describe the X.75 *port* utilization report and then an X.75 *port* performance report.)

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM MODULE PERFORMANCE REPORT X.75 printed: 01-02-98 14:46 daily: 01-01-98 reporting intervals: 00:00 - 11:59 nodes: all								
NODE NAME	MOD ADDR	INTVL	% AVG M. PROC. BUSY	% PEAK M. PROC. BUSY	PACKETS -recv -trans	INTRPTS BUFF NOT AVAIL	CONGEST ENT SEC	
nodo1	20	0:00 0:59	1	2	12 36	0	0	
		1:00 1:59	2	2	12 36	0	0	
		2:00 2:59	1	2	19 60	0	0	
		3:00 3:59	2	3	2521 7860	0	0	

Screen 6-38. Sample X.75 Module Performance Report

Report Interpretation

This report shows the performance of X.75 modules. The percentage values found in the %AVG M. PROC. BUSY and %PEAK M. PROC. BUSY fields can be used to determine if the module is being used at its full capacity. If these values are being used to determine if the module can process more data, it should be used in conjunction with the %AVG LINE UTIL and %PEAK LINE UTIL statistics in the X.75 Port Utilization Report (see report sample on next page) to determine if both the main processors and the I/O processors can handle more data.

X.75 Port Performance Report

This report provides port performance data for an X.75 Module.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM PORT PERFORMANCE REPORT X.75 printed: 01-02-98 14:46 daily: 01-01-98 reporting intervals: 00:00 - 11:59 nodes: all module: all							
NODE NAME	MOD ADDR	INTVL	SPEED	TOTAL FRAMES -recv -trans	BAD FRAMES	RCVR OVRNS	CALLS ABN. TERM
				REJ. -recv -trans	RNR -recv -trans		
nodo1	20	3:00	64	136	0	0	4
	1	3:59		146			
				0	0		
				0	0		
		4:00	64	163	0	0	3
		4:59		208			
				0	0		
				0	0		

Screen 6-39. Sample X.75 Port Performance Report

Report Interpretation

This report shows the performance of X.75 ports. The BAD FRAMES value represents the number of faulty frames that the X.75 module received in the reporting interval. There are three types of faulty frames: a frame with a non-integral number of octets, an aborted frame, and a frame with a bad frame check sequence (FCS).

When the module receives a bad frame, it discards that frame. There are two causes of bad frames: a faulty access device, such as a router, or transmission errors on the facilities. If the BAD FRAMES value is high, do the following to determine the cause of the problem:

- If there is another port connected to the same access device, determine if that port also has a BAD FRAMES count. If it does, the most likely cause is a bad access device.

- If the other port is not receiving a high number of BAD FRAMES, the most likely cause of the high count is transmission errors on the facilities.
- If there are no other ports connected to the same access device, diagnostic tests should be run on the facilities and the access device (where available) to isolate the cause of the problem.

The REJ. FRAMES recv. value represents the number of times that a local module had to discard frames due to out of sequence frames received by the remote STE. The REJ. FRAMES trans. value represents the number of times that a local module had to discard frames due to out of sequence frames received from the remote STE.

The RNR FRAMES recv. value represents the number of times the remote STE received an I-frame or an RR frame in a busy condition (no resources available). The RNR FRAMES trans. value represents the number of times the local STE received an I-frame or an RR frame in a busy condition (no resources available).

The RCVR OVRNS value represents the number of times the local STE detected an overrun condition on the receiving device.

The CALLS ABN. TERM. represents the number of calls that have been cleared.

X.75 Port Utilization Report

This report provides port utilization data for an X.75 Module. The report can be sorted on a module or interval basis.

StarKeeper (R) II NMS PERFORMANCE MEASUREMENTS SYSTEM PORT UTILIZATION REPORT X.75 printed: 01-02-98 14:46 daily: 01-01-98 reporting intervals: 00:00 - 11:59 nodes: all modules: all								
NODE NAME	MOD ADDR	SPEED	INTVL	%AVG LINE UTIL.	%PEAK LINE UTIL.	TOTAL BYTES -recv -trans	TOTAL FRAMES -recv -trans	
nodo1	20	64	3:00	3	12	836	136	
	1		3:59	2	6	586	146	
			4:00	2	4	506	163	
			4:59	3	5	771	208	

Screen 6-40. Sample X.75 Port Utilization Report

Report Interpretation

This report shows the usage of X.75 ports. The %AVG LINE UTIL and %PEAK LINE UTIL fields can be used in conjunction with the %AVG M. PROC. BUSY and %PEAK M. PROC. BUSY statistics in the preceding X.75 Module Performance Report to determine if ports should be added or removed.

It is important that the line speed at which the X.75 port is configured matches the line speed supplied by the attached device. If not, the % AVG LINE UTIL and % PEAK LINE UTIL values may not be accurate as they are calculated based on the configured line speed, not actual.

The configured speed does not restrict the amount of data sent over the line nor does it define a limitation of the bps (unless of course you configure it at the maximum speed). The percentage values of these fields may be over 100% if the data is going over the line at a higher rate than the port is configured. If you find values that exceed 100%, check that the port is configured to match the actual rate.

Billing Reports

The billing subsystem collects, stores, manipulates, and prints billing data generated by the network nodes. The administrator can request the generation of reports covering a specified number of days. For instructions on how to view the data retention period and the current charges, and how to set or change them, refer to **Billing Management** in **Chapter 3**.

Billing must be administered at the node; use the *StarKeeper II* NMS pass-through feature to issue the node **enter address** command and enter the service address *billing* in the database. (Run **help** for a complete discussion of the pass-through feature.) The node sets up a special port to collect the information. The billing capability is then enabled on a per-port basis, for originating ports only, when the ports are configured. Refer to the node manuals for complete coverage.

A description and example of each report listed below are in the next few sections. All reports are for a requested time period. There is an example of each report including an explanation of the fields in the report and an interpretation of the report. Refer to the table below for a list of Billing Reports, a brief description of each, reference to the page where an example report appears, and the name of the database tables used to generate the report.

Report Name	Description	Page	DB table
Administered Call Setup	Billing list of non-switched calls	6-79	node, b_continue, pvc_conct, pvc, mod_lkup
Call Activity	Billing list of calls	6-80	node, nodes, pvc, b_continue, pvc_conct, mod_lkup
Call Hold Detail	Billing list of calls placed on hold	6-81	node, nodes, mod_lkup
Call Summary	Billing totals of calls	6-82	node, nodes, pvc, b_continue, pvc_conct, mod_lkup
Error	List of errors detected by the billing report process	6-83	node, err_up, err_pvc, mod_lkup, err_conn, b_continue, err_hold_rconct, err_term, x25_cerr, x25_terr, x75_cerr, x75_cnterr, x75_terr
PDN/X25 Call Activity	Billing list of X.25 calls	6-84	node, x25
X.75 Call Activity	Billing list of X.75 calls for DK II R4.0 (or later)	6-85	node, x75

Getting Billing Reports

The steps for getting billing reports are shown below in Procedure 6-3. If you need more information in order to make an entry, refer to the **Billing Report Entries Description** which follows the procedure. Screen 6-37 shows an example of the sequence of queries when using the billing option of the **report** command. In the example, the default selection is chosen in each case, *except for the additional parameters choice*.

Procedure 6-3. How to Get Billing Reports

1. At the SK: prompt, enter **report**, or just **rep**.
To exit the report, at any time, use the Del.
2. You are queried for the REPORT TYPE. Enter **billing** or just **b**.
3. The screen queries you for the BILLING REPORT NAME. Enter the name of the billing report you desire from the alphabetical list (activity, admin_call, call_hold, error, summary, x25; the default is *activity*).
4. The screen queries you for a list of NODE NAMES. Enter your list of nodes (maximum of 5) separated by commas; the default is *all*.
5. A message states that nodes are being verified and then asks if you want to include the deleted nodes, enter yes (**y**) or no (**n**). (*Deleted nodes* are those removed by the **cfdelete** command; the nodes are removed, but the historical data remains, if you want it.)
6. The screen continues to query for more information regarding your billing report. Some of the information is to identify the report in the report heading and some is to gather data for the body of the report. The remaining queries, with the supplied choices and default values, are shown in the screen below. Answer each line as appropriate; choose defaults if applicable. Each query line is explained in the section that follows this procedure, titled **Billing Report Entries Description**. Data collected (other than defaults) may alter the headings in the reports.



NOTE:

The sample list of queries, as shown below, is made longer by the yes answer to the ADDITIONAL PARAMETER SELECTION DESIRED? query; if the answer were *no*, there would have been no further queries. Understand that the queries are tailored to the individual reports.

7. When you answer the final query, the screen displays a message asking if you want the report sent to a printer or to your screen. Answer appropriately; the default is *screen*.

8. The screen responds with a message stating the request is (or is not) being processed, and you are returned to the SK: prompt.

```
SK: report
REPORT TYPE [ alarm, billing, performance ]: b
BILLING REPORT NAME [ activity, admin_call, call_hold, error, summary,
                    x25, x75: +(activity) ]: <CR>
NODE NAMES [ comma separated list of node names (at most 5): +(all) ]: <CR>
    Verifying all nodes
Do you want to include the deleted nodes? [ yes or no: +(no) ]: <CR>
    Assembling list of node names, please wait...
    Verified: silver
    Verified: gold
    Verified: national/east/forest/node1
ORIGIN [ comma separated list of origination (group) names
        (at most 5): +(all) ]: <CR>
BEGINNING DATE OF REPORT PERIOD [ mmddyy: +(present date) ]: <CR>
ENDING DATE OF REPORT PERIOD [ mmddyy: +(tomorrow's date) ]: <CR>
PRIMARY SORT [ node, origination_name: +(node) ]: <CR>
DURATION CHARGE PER HOUR [ dd.cc : +(0.00) ]: <CR>
CHARGE (CENTS) PER MESSAGE UNIT [ c.xxxx : +(1.0000) ]: <CR>
ADDITIONAL PARAMETER SELECTION DESIRED? [ yes or no: +(no) ]: y
CALL DESTINATION [ local, remote: +(all) ]: <CR>
DIALSTRINGS [ comma separated list of destinations or service addresses
             (at most 5): +(all) ]: <CR>
START TIME OF SELECTION INTERVAL [ hh:mm: +(00:00) ]: <CR>
FINISH TIME OF SELECTION INTERVAL [ hh:mm: +(00:00) ]: <CR>
ORIGINATING MODULE ADDRESSES [ comma separated list of addresses;
                              link.lport/mod[.chan], link/mod[.chan] or
                              mod[.chan] (at most 5): +(all) ]: <CR>
ORIGINATING MODULE TYPE [ asynchronous, bridge, host, synchronous,
                        sync_async: +(all) ]: <CR>
CALL TYPE [ held, non-switched, switched: +(all) ]: <CR>
MINIMUM CALL DURATION [ hh:mm : +(00:00) ]: <CR>
MINIMUM NUMBER OF MESSAGE UNITS [ up to 10 digits: +(0) ]: <CR>
MINIMUM CALL COST [ dd.cc : +(0.00) ]: <CR>
REPORT OUTPUT [ printer, screen: +(screen) ]: <CR>
```

Screen 6-41. Sample Billing Report Queries

An explanation, an example, and interpretation guidelines appear later in this section for each type of billing report. Refer to the applicable report heading.

Billing Report Entries Description

All entries are described below; in actual usage you only encounter those that are applicable to your choices.

- **BILLING REPORT NAME** - Specifies the desired report: call activity report, call summary report, call hold detail report, administered call setup report, X.25 call activity report, X.75 call activity report, or error report.
- **X.25 FOR BNS-2000 OR DATAKIT II VCS R2.0 (OR LATER)** - Appears only for X.25 Call Activity Report. Answer yes for X.25 calls made from a node.
- **CALLING DTE ADDRESSES** - (*For PDN/X.25 reports*) Enter the X.121 numeric addresses (a maximum of five) for the calling (origination) DTEs, using a comma-separated list. Four to fifteen digits are used for the X.121 address. Refer to the X.121 Addressing description in **Chapter 7**, or to Chapter 2 of the node *Administration Guide*, if you need more information.
- **NODE NAMES** - List the node names as used by *StarKeeper II* NMS, (at most 5), separated by commas, to restrict the set of nodes included in the report. If you request reports on all nodes you are further prompted for inclusion of deleted nodes. Nodes with inactive billing connections may be specified when prompted for node names. Deleted nodes are nodes purged from the system through **cfdelete**, but historical information may still exist.



NOTE:

Address expansion is supported. For example, *silver* is understood to mean *national/west/garden/silver*.

- **ORIGIN** - List the names of the groups that originated calls (a maximum of five) that you are billing. Choosing the default *all* places no limiting factor according to the names of the groups that originated calls.
- **BEGINNING/ENDING DATE OF REPORT PERIOD** - Indicates begin/end date of desired report period. Defaults are first day for which there are billing records, and last day for which there are billing records. Therefore, up-to-the-minute billing information is available. Billing data is available for the period of time specified by the *data retention period* in the Billing Management operation (See **Chapter 3** for complete information.) To get billing reports for calls prior to the retention period, refer to the section titled **Performance and Billing Data Archiving** in this chapter.
- **PRIMARY SORT** - Specifies whether the first sort criteria is by nodes or originating service addresses.
- **DURATION CHARGE PER HOUR** - Specifies the call billing hourly rate. 1.00 represents one dollar per hour.
- **CHARGE (CENTS) PER MESSAGE UNIT** - Specifies the call charge on a per message unit basis. 1.0000 represents one cent per message unit.

- **ADDITIONAL PARAMETER SELECTION DESIRED?** - Indicates whether the standard call activity report is desired (choose *no*) or whether the administrator wants to select additional parameters (choose *yes*). The parameters that may be selected comprise the remainder of this list (if *yes* is selected).
 - **CALL DESTINATION** - Specify if the report is just for local calls (origination and destination are on the same node) or remote calls (the call is switched through two or more nodes), or all nodes. The default is *all*.
 - **DIALSTRINGS** - List of destinations (service addresses), separated by commas, to restrict the set of destinations included in the report. A maximum of five destinations may be specified. Choosing the default *all* places no limiting factor according to destination on the report.
 - **START/FINISH TIME OF SELECTION INTERVAL** - Limits time range during which calls are reported.
 - There is a "fine line" distinction between 24:00 and 00:00. 24:00 is the last moment before midnight; 00:00 is the first moment after midnight. Use 00:00 as a starting time and 24:00 as an ending time.
 - **ORIGINATING MODULE ADDRESSES** - A list of module addresses and (optionally) channels on the call-originating module (channel), separated by commas, to restrict a set of call-originating addresses included in the report. A maximum of five addresses may be specified. Use the format: link.lport/module.channel, link/module.channel or module.channel (where channel is optional; if not specified, all channels are included in the report). Choosing the default *all* places no limiting factor according to the call originating module (and channel) on the report. For Frame Relay modules, you can only specify down to the module address.
 - **ORIGINATING MODULE TYPE** - A specification of module types (asynchronous, synchronous, and so forth), separated by commas, to restrict a set of call-originating module types included in the report. Choosing the default *all* places no limiting factor according to the type of module that originated calls.
 - **CALL TYPE** (for non-X.25 calls) - Specifies the call type (held, non-switched, switched) that is to be included in the report.

<i>held</i>	those calls that were placed "on hold."
<i>non-switched</i>	those calls that were administered from origin to destination. They are predetermined destination (PDD) calls.
<i>switched</i>	those calls that were made (addressed) from origin to destination through one or more nodes.

- CALL TYPE (for X.25 calls) - Specifies the X.25 call type (*host* or *pdn*) that is to be included in the report.
 - host* those X.25 calls that were placed to an X.25 host.
 - pdn* those X.25 calls that were placed to a Public Data Network (PDN).
- CALL TYPE (for X.75 calls) - Specifies the X.75 call type (*PVC* or *SVC*) that is to be included in the report.
 - PVC* X.75 Permanent Virtual Circuit calls
 - SVC* X.75 Switched Virtual Circuit calls
- MINIMUM CALL DURATION - Specifies call duration threshold for reporting calls. The threshold is entered in hh:mm format, but is reported in hours and fractions of hours. For example, if you want to limit the report to calls that lasted a half hour or more, you would specify: 00:30.
- MINIMUM HELD TIME - Specifies call hold duration for calls placed on hold. The threshold is entered in hh:mm format, but is reported in hours and fractions of hours. For example, if you want to limit the report to calls that were held for a half hour or more, you would specify: 00:30.
- MINIMUM NUMBER OF MESSAGE UNITS - Specifies threshold for number of message units (up to ten digits) for reporting calls. For example, if you want to limit the report to calls that contained one hundred message units or more, you would specify: 100.
- MINIMUM CALL COST - Specifies call cost threshold for reporting calls. For example, if you want to limit the report to calls that cost \$5.00 or more, you would specify: 5.00.
- SORT BY CALL TYPE - (Only for X.25 Call Activity Report on BNS-2000 or *Datakit II* Release 2.0 nodes and later.) Indicates whether *pdn* and *host* calls should be grouped separately (answer *yes*) or mixed together (answer *no*).
- CALLED DTE ADDRESSES - (For all X.25 reports) Enter the X.121 numeric addresses for called (destination) DTEs using a comma-separated list. A maximum of five X.121 addresses may be specified. Four to fifteen digits are used for the X.121 address; fifteen digits are used in the North American format and four to fifteen digits can call the gateway (for international formats).
- REPORT OUTPUT - Choose whether you want the report sent to a *printer* or to your console *screen*. Default is *screen*.

Administered Call Setup Report

This report is a separate breakout of administered (non-switched) calls. It does not necessarily have to be used for billing purposes; but rather to monitor the calls over the network. For example, you might find that an administered circuit is not being used frequently, since it has a long duration and very low packet count.

StarKeeper (R) II NMS BILLING SYSTEM						
ADMINISTERED CALL SETUP REPORT						
NODE: national/east/exchange/node1						
ORIGIN ADDRESS	DESTINATION ADDRESS DIALSTRING	DATE TIME ESTB	DURATN (days) (hh:mm)	TO DEST MSG UNITS	FROM DEST MSG UNITS	
lab1 34/2.2	east/node3/service2 34/2.1 level1/level2/level3/level4	11-12 15:00	9 11:00	100 as of 02:00	200 03-12-98	
originator 78/3.4	dialstring/dialstring 34/3.3 level1/level2/level3/level4	11-20 10:00	0 13:53	750	830	
NODE: national/east/exchange/node2						
35/2.2	36/2.1	11-13 16:00	4 11:00	50 as of 02:00	200* 03-12-98	
originator 75/3.4	dialstring/dialstring 36/3.3 level1/level2/level3/level4	11-20 10:00	0 13:53	550	430	
NODE: national/east/exch3/newnode						
original2 45/2.3	east/exch2/hostB 77.6 level1/level2/level3/level4	11-10 15:00	11 12:18	789 as of 03:30	566 03-12-98	

Screen 6-42. Sample Administered Call Setup Report

Report Interpretation

The report provides a focused look at administered (non-switched) calls. It shows the entire duration (up to the end time of the report) of administered calls, whereas the Call Activity report does "time slicing." The report uses the start and end dates to see which calls were up at that time. However, the actual start time of the call is used instead of the prompted start time. The duration of the call is from when the call was initially established until the end time specified at the report request, or the end time of the call if it completed before the specified end time (yet still active at the start time). The packets are reported as the number of packets sent during the duration of the call.

Call Activity Report

This report shows all the network calls that conform to your requests specified with the **report** command and the billing option. You can list individual calls for individual nodes, a range of nodes, or all the nodes in a network. This example report is primarily sorted according to nodes.

StarKeeper (R) II NMS BILLING SYSTEM				
CALL ACTIVITY REPORT				
Duration Charge: \$1.00 per hour, Charge per Message Unit: 0.0010 cents				
ORIGIN: nj/exch1/node1 38.8				
DATE TIME	DIALSTRING	DURATN&	MSG UNITS	CHARGE
01-05 08:00		30:00	167884	31.68*
			as of 14:00 01-01-98	
	TOTAL	30:00	167884	31.68
	ORIGINATING NAME TOTAL	30:00	167884	31.68
ORIGIN: nj/exch4/node4 origrp4 7.4				
01-08 18:23	nj/exch5/dest2	0:03	1057	0.06
01-08 18:32	nj/exch5/dest2	0:03	1057	0.06
	TOTAL	0:06	2114	0.12
	ORIGINATING NAME TOTAL	0:06	2114	0.12
* This total includes at least one call which was missing data (i.e., date/time and message units) from a record which should have been received prior to the start of the report period.				
& Seconds are not shown but are included in the charge.				

Screen 6-43. Sample Call Activity Report

Report Interpretation

The report is essential for billing purposes and is very helpful for network and user analysis. It gives a time slice of the administered call based on the values selected at the start and end time prompts. The node periodically sends activity records that describe the status of administered calls. The report Date/Time field is the time of the last activity record received before the start of the time slice. The Duration field is from that time until the time of the last activity record received before the end of the time slice. The Msg Units field is the amount of call traffic during this interval.

For switched calls, an extended DURATION coupled with a low number of MSG UNITS shows inefficient usage of network resources.

The report reflects "time slices" to avoid duplicate billing; those cases are noted with the words: as of <time> <date> Some calls have an asterisk (in the right hand column) to reflect calls that are missing data. The report does not capture

X.25 calls; specify the X.25 Call Activity Report for that billing data. Also, refer to the Administered Call Setup Report for a separate listing of administered (non-switched) calls.

Call Hold Detail Report

This report is a separate breakout of calls that were placed on hold.

StarKeeper (R) II NMS BILLING SYSTEM CALL HOLD DETAIL REPORT Report Period: 01-01-98 through 01-01-98 Printed: 01-01-98 19:08:11				
ORIGIN: national/west/garden/gold techpubs 45/3.4				
DATE TIME	DIALSTRING	DURATION	HELD	MSG UNITS
03-15 00:01	national/west/garden/platinum	1:00	0:30	174
03-15 07:00	national/west/garden/silver	10:00	2:00	1221
ORIGIN: national/west/exch3/node2 originator 88/3.3				
03-15 10:00	national/east/exch/host5	27:46	13:53	117754745
03-15 15:00	national/east/dialstring	5:33	1:00	33333
03-16 02:00	national/east/exch2/service	8:00	2:33	1343422
03-16 04:55	national/east/exchange/service2	12:00	2:11	2424
ORIGIN: national/west/garden/silver acctg 15/3.4				
03-17 00:01	national/west/garden/platinum	1:00	0:30	174
03-17 07:00	national/west/garden/silver	10:00	2:00	1221

Screen 6-44. Sample Call Hold Detail Report

Report Interpretation

The report provides a good analysis of the ratio of activity to actual up time.

Use this report to ensure that users are not tying up resources unnecessarily. Remember that the charge for a call in the Call Activity or Summary Reports is based on the total duration of the call with no adjustment for held time. So, if someone has a call up for 8 hours, and only uses that connection for 15 minutes, that call gets billed for an 8-hour connection.

Call Summary Report

This report summarizes (totals) switched and administered calls that were completed during the reporting period. The report reflects "time slices" to avoid duplicate billing. Those cases are presented as footnotes. To see details of each call, refer to the Call Activity Report.

StarKeeper (R) II NMS BILLING SYSTEM				
CALL SUMMARY REPORT				
Duration Charge: \$1.00 per hour, Charge per Message Unit: 0.0010 cents				
ORIGIN: nj/exch1/node1 38.8				
DIALSTRING	CALLS	DURATION&	MSG UNITS	CHARGE
	1	30:00+	167884	31.68*
TOTAL	1	30:00	167884	31.68
ORIGINATING NAME TOTAL	1	30:00	167884	31.68
ORIGIN: nj/exch4/node4 origrp4 7.4				
nj/exch5/dest2	2	0:06	2114	0.12
TOTAL	2	0:06	2114	0.12
ORIGINATING NAME TOTAL	2	0:06	2114	0.12
+ This total includes at least one call which was still active at the time the report period ended.				
* This total includes at least one call which was missing data (i.e., date/time and message units) from a record which should have been received prior to the start of the report period.				
& Seconds are not shown but are included in the charge.				

Screen 6-45. Sample Call Summary Report

Report Interpretation

The report is useful for monitoring the general activities of each user. It gives a time slice of the administered call based on the values selected at the start and end time prompts. The duration value for the call reflects the start and end time. Similarly, the message units count only reflects the number of message units sent and received over the specified report period.

The sample report shows footnotes to help interpret the data. Some calls, in the DURATION column, have a plus sign (+) that are footnoted as being still active during the report period. The report is for completed switched calls, completed non-switched calls, and active non-switched calls; so the still active call is a non-switched (administered) call. Some calls, in the CHARGE column, have an asterisk (*). As explained, since the report reflects time slices, the charge shown recognizes some data are not available.

Error Report

Each time the billing process encounters an error, an entry is made in the error report. The billing process looks for expected call sequences; such as a connection that pairs with a termination, or when a call is placed on hold there should be a reconnection. If these call sequence events do not properly match, an entry is made in the error report.

StarKeeper (R) II NMS BILLING SYSTEM ERROR REPORT Report period: 01-01-98 to 01-02-98 Printed: 01-02-98 16:45:09				
NODE: usa/nj/exch/billnode Connection up: 01-02 20:12; 1222 records lost				
ORIGIN ADDRESS	DEST ADDRESS DIALSTRING	DATE TIME	TYPE	MSG UNITS
origrp2 55.5	destgrp2 30.5 usa/ny/exch2/dest2	01-09 16:41	adm call	
origrp1 34.3	destgrp1 20.3 usa/nj/exch/dest	01-09 16:41	conn	
32/6.3	5.3	01-09 16:41	cont	11
19.2	20.2	01-09 16:41	held	3444
19.2	20.2	01-09 16:41	rcon	
32.3	53.4	01-09 16:41	term	2006
ogrpnam 19.5	20.5 dialnam3	01-09 16:41	x25 conn	
29.3	60.2	01-09 16:41	x25 term	

Screen 6-46. Sample Billing Error

Report Interpretation

An explanation of each error type is listed below. Investigate errors that occur frequently.

<i>admn call</i>	An administered call (PDD or PVC) was made, but a matching <i>terminate</i> was not found.
<i>conn</i>	A switched call was made (connected), but a matching <i>terminate</i> was not found.

<i>cont</i>	An administered call (<i>continuation</i> record) does not have a matching <i>connect</i> record.
<i>held</i>	A held call does not have a matching <i>connect</i> record, or a <i>reconnect</i> record was missed.
<i>rcon</i>	A held call was reconnected, but a matching <i>hold</i> was not found.
<i>term</i>	A call (switched or administered) was terminated, but it does not have a matching <i>connect</i> record.
<i>x25 conn</i>	A PDN or X.25 call was made (connected), but a matching <i>X.25 terminate</i> record was not found.
<i>x25 term</i>	A PDN or X.25 call was terminated, but a matching <i>X.25 connect</i> record was not found.

Connection up, continuation, held and reconnect information can also show up on other billing reports. Administered call, connect, terminate, X.25 connect, and X.25 terminate errors can only affect this report.

Check date and time of *connection up* with errors listed in the report. Loss of connection may explain some of the errors.

PDN/X.25 Host Call Activity Report

This report is a separate listing of the charges for all calls made to a PDN or X.25 host from a node.

StarKeeper (R) II NMS BILLING SYSTEM PUBLIC DATA NETWORK/X.25 CALL ACTIVITY REPORT						
Duration Charge: \$1.00 per hour, Charge per Message Unit: 0.0010 cents						
CALLING DTE: 00883015805660 165.3						
DATE	TIME	DIALSTRING CALL TYPE/CALLED DTE	DURATN&	MSG UNITS	CHARGE	
1. 01-11-98	14:19	gold PDN 00883015805891	0:01	37	.45	
2. 01-12-98	15:23	silver X.25Host 00883015805465	0:10	1325	14.10	
3. 01-12-98	15:52	silver X.25Host 00883015805465	0:08	1560	16.30	
TOTAL			0:19	2922	30.77	

Screen 6-47. Sample PDN/X.25 Host Call Activity Report

Report Interpretation

The report provides a focused look at X.25 and PDN calls made from a node. An extended duration coupled with a low message unit count shows inefficient usage

of network resources. Interpret the report in the same way you would for the calls shown in the Call Activity Report.

X.75 Call Activity Report

This report shows all the network calls that conform to your requests specified with the **report** command and the billing option. You can list individual calls for individual nodes, a range of nodes, or all the nodes in a network.

StarKeeper (R) II NMS BILLING SYSTEM						
SVC CALLS						
CALL ACTIVITY REPORT						
Duration Charge: \$0.10 per hour, Charge per Msg Unit (BPI-1): 1.0100 c.						
Charge per Msg Unit (BPI-2): 3.0000 c., Charge per Msg Unit (BPI-3): 5.5500 c.						
Call Type: svc						
-1-						
CALLING DTE:	MOD/PORT:	20.1	CALLED DTE:	MOD/PORT:	46.6	
DATE	TIME	DIALSTRING	PVC	DURATN&	MSG UNITS	CHARGE
1. 01-01-98	14:58	2002	0	< 0:01	0	0.00
TOTAL				0:01	0	0.00
CALLING DTE:	20803320014606	MOD/PORT:	20.1	CALLED DTE:	22226001	MOD/PORT: 46.6
1. 01-01-98	13:53	2002	0	0:07	346	0.36
2. 01-01-98	14:21	2002	0	0:09	348	0.36
3. 01-01-98	14:59	2002	0	0:14	1120	1.14
4. 01-01-98	15:15	2002	0	0:08	11320	11.34
TOTAL				0:38	13134	13.20
ALLING DTE:	20803330022302	MOD/PORT:	20.1	CALLED DTE:	22226001	MOD/PORT: 23.2
1. 01-01-98	13:46	2002	0	0:04	1856	1.86
TOTAL				0:04	1856	1.86
& Seconds are not shown but are included in the charge.						

Screen 6-48. Sample X.75 Call Activity

Report Interpretation

The report is essential for billing purposes and very helpful for network and user analysis. It gives a time slice of the administered call based on the values selected at the start and end time prompts. The duration value for the call reflects the start and end time. If the value under PVC is 0 then the call type is an SVC, if it is 1 the call type is a PVC.

Performance and Billing Data Archiving

In case you want to use the performance and billing data to print reports at a later time, you should back up (archive) the data on a cartridge tape for storage and safekeeping. Use the *StarKeeper II* NMS **skbackup** command to transfer performance and billing data to a cartridge tape; the **-p** option specifies the performance database and the **-b** option specifies the billing database. Procedures for backing up and restoring the performance and billing data (and other software) are provided in **Chapter 7**, the section titled **Backup and Recovery of your Starkeeper II NMS System Data Files**.

Data available on cartridge tape can be restored to the host *StarKeeper II* NMS using the **res_rpt** command. When you are finished using the data, you should delete it from on-line storage using the **rem_rpt** command. See the following sections for complete instructions.

Retrieving Archived Data for Reports

Archived data can be restored to generate billing and performance reports by using the *StarKeeper II* NMS **res_rpt** command. To use this command you must be logged in as **cnmsadm** and you must use the **root** password when prompted for it. Run **help** for complete coverage of the **res_rpt** entry including a listing of the possible system responses (error messages). Use the **report -r** command to print reports from restored data; when you are finished, use **rem_rpt** (Procedure 6-5) to remove the report data. To generate a billing or performance report from archived data, follow the steps in the procedure below.

If you have restored data previously, the data must be removed before you can restore data again. Refer to Procedure 6-5 for instructions on removing restored data.

Procedure 6-4. How to Restore Archived Data for Reports

1. At the SK: prompt, enter **res_rpt**.
2. You are prompted for information (options) regarding Report Type (billing or performance), Report Name, and the directory to store the temporary database. Supply the data required or press to choose the defaults.
3. The system responds with messages to keep you apprised of the restoration process. One message states that the system is Checking the command line options; please wait...".



NOTE:

Do not interrupt (by pressing) the processing steps associated with the command line options.

4. When the command line options check is finished, the systems sends an *OK* message and prompts you for the root password. Enter the **root** password.
5. Insert the cartridge tape into the tape drive and close the latch. When ready, press .
6. The system displays a series of messages to keep you apprised of progress in the restoration process. When finished, the following message is displayed.

Data has been restored successfully.
You can remove the tape from the tape drive.
7. You are now ready to obtain reports using the *StarKeeper II* NMS **report -r** command. Refer to Procedure 6-1 for a general procedure for requesting reports, or to Procedure 6-2 for performance reports, or to Procedure 6-3 for billing reports.
8. When you are finished with the restored data, remove it by following the steps in Procedure 6-5.

Removing Restored Data for Reports

After restoring data for a report (Procedure 6-4), you should remove the data, using the **rem_rpt** command so that space is available for the next time you want to restore data. To use this command you must be logged in as cnmsadm and you must use the **root** password when prompted for it. Run **help** for complete coverage including a listing of the possible system responses (error messages) of the **rem_rpt** entry.

Before removing any data, the command sequence displays information regarding the restored data in the directory. You then have the option of terminating the command or continuing to remove the data. To remove data that was previously restored, follow the steps in the procedure below.

Procedure 6-5. How to Remove Restored Data

1. At the SK: prompt, enter **rem_rpt**.
2. System messages display information concerning the restored data; such as: when the restoration took place, the type of reports that can be generated from the restored data, and the path to the directory where the stored data resides.
3. The system then asks for a confirmation that you still want to remove the restored data. If you respond **n**, the command terminates and you are returned to the SK: prompt. If you respond with **y**, the process removes the data and displays a message that the removal is done.
4. You are returned to the SK: prompt.

Alarm Reports

The alarm subsystem collects, stores, manipulates, and prints alarm data generated by the nodes in the network and the *StarKeeper II* NMS. The administrator can request alarm reports covering a specified number of days. For instructions on how to change the alarm data retention period, refer to **Chapter 3**, the section titled **Alarm Management**. The following tables are used to generate the Alarm Summary Report: node, dystate, wkstat, and mnstat.

Getting Alarm Reports

To get alarm reports, follow the steps in the procedure below. To exit the report prompting at any time, press **(Del)**; you are returned to the SK: prompt. An example of the prompting and entry sequence is shown in the screen following the procedure.

Procedure 6-6. How to Get Alarm Reports

1. At the SK: prompt, enter **report**.
2. You are queried for the REPORT TYPE. Enter **alarm** or just **a**.
3. The screen queries you for the SUMMARY PERIOD. Choose *daily*, *weekly*, or *monthly*; the default is *daily*.
4. The screen queries for the DATE OF REPORT. Enter the date, or choose the default, which is the most recent report. Do not enter today's date; to get a listing of today's alarms, use **alstat**. See **Chapter 5**, the section titled **Getting a Status Report of Alarms**.
5. The screen queries for a list of NODE NAMES. Enter your list of nodes (maximum of 5) separated by commas; the default is *all*. A message states that nodes are being verified and then prints a list of the verified nodes.
6. The screen queries for the ALARM SEVERITY CATEGORIES. Specify critical, major, or minor; the default is all three categories.
7. The screen queries for the ALARM COUNT THRESHOLDS for the categories of alarms that you requested. Enter the threshold count for each category of alarm.
8. When you answer the final query, the screen displays a message (REPORT OUTPUT) asking if you want the report sent to a printer or to your screen. Answer appropriately; the default is *screen*.
9. The screen responds with a message stating the request is (or is not) being processed, and you are returned to the SK: prompt.

```

SK: report
REPORT TYPE [ alarm, billing, performance ]: a
SUMMARY PERIOD [ daily, weekly, monthly: +(daily) ]: d, w, orm
DATE OF REPORT [ mmddyy: +(<yesterday's date>) ]: specify date of report,
                                     or choose yesterday's date as the default
NODE NAMES [ comma separated list of node names (at most 5): +(all) ]: <CR>
                                     enter up to 5 node names or choose all as the default
ALARM SEVERITY CATEGORIES [ comma separated list of alarm categories,
(critical, major, minor: +(all) ]: cr,ma,mi
ALARM COUNT THRESHOLDS-
  CRITICAL [ +(0) ]: 1
  MAJOR [ +(0) ]: 3
  MINOR [ +(0) ]: 6
REPORT OUTPUT [ printer, screen: +(screen) ]: <CR>

```

Screen 6-49. Prompting Sequence for the Alarm Summary Report

Alarm Summary Report

A sample Alarm Summary Report is shown below.

```

StarKeeper (R) II NMS ALARM SUMMARY REPORT
      monthly: 06-01-98
      printed: 07-13-98 20:59:03
      nodes: all
      severities and thresholds:
        critical: 1
        major: 3
        minor: 6

NET ADDRESS
SEVERITY      MSGID      SYSTEM TYPE  MODULE TYPE  TOTAL COUNT
MESSAGE TEXT

CNMS
*C            50026      CNMS                    22
REPORT CNMSMSG xport: Exiting due to receipt of signal 2

CNMS
**            50011      CNMS                    14
REPORT CNMSMSG xport: usage: xport -f SKIM_file [-s] [-c conn_name] [-P
pfilter] [-N nfilter] [-x text_redef [-e] [-E]] [-i] [-n] [-D] [-t timeout]

CNMS
**            10033      CNMS                     9
REPORT CNMSMSG cnms_mon: Process al_action (5982) terminated abnormally.
west/957/platinum

**            1234      DKII            ty12          4
REPORT PANIC!! unexpected supervisor bus error

```

Screen 6-50. Sample Alarm Summary Report

Field Descriptions

Note that the first column has a tiered format; that is, one field of information rests on top of another field, which rests on a third field of information. Since the column heading is tiered, the body of the report has the same tiered structure according to the heading.

- NET ADDRESS,SEVERITY,MESSAGE TEXT - *Net address* on the top line is the full path name of the node where the alarm occurred, or *CNMS* for alarms that were generated by the *StarKeeper II* NMS. *Severity* on the middle line shows the alarm category severity, either critical, minor, or major. *Message text* on the bottom line is the associated alarm text.
- MESSAGE ID - The alarm message identification number.
- SYSTEM TYPE - States whether the alarm is a network alarm or CNMS if it is a *StarKeeper II* NMS alarm.
- MODULE TYPE - The module type (for example, *ty12*.) This is blank when module type is not applicable.
- TOTAL COUNT - The number of times this alarm occurred since the last time it was cleared (during the summary period).

Report Interpretation

The alarm summary report gives important data on the operation of the network for troubleshooting purposes. Look for frequent or commonly occurring alarms.

If an alarm occurs between midnight and the time that nightly alarm summarization occurs (usually 12:30am), and there was at least one occurrence of the alarm on the previous day, then the new alarm will be included in the summary count for the alarm, and the summary date will be changed to the date that the summarization occurred. For example, alarm 1087 occurs five times on Feb 10, and then occurs again on Feb 11 at 12:10am, twenty minutes before nightly alarm summarization begins. When alarm summarization completes, there will be one new summary for alarm 1087. It will have a summary count of 6, and a summary date of Feb 11. There will *not* be two summaries for alarm 1087: one for Feb 10 with a summary count of 5, and one for Feb 11 with a summary count of 1. Note that the weekly and monthly summaries could be similarly affected if the last day of the week or month is being summarized. In this manner, the reporting period is like a "fiscal year" that starts and ends different from the calendar year. In this case, we define the day as from summarization to summarization.

Producing Custom Reports

Using the information in the *StarKeeper II* NMS database, you can produce your own customized reports. Also, INFORMIX-SQL menus can be used to produce *default reports*; which are reports based on a single *StarKeeper II* NMS database table and displayed on your screen. You can create an original report using the INFORMIX-SQL ACE Report Writer. This section describes the procedures needed to produce reports for each of these scenarios. However, before you begin, you will need some additional information.

Before You Begin

If you plan on using the INFORMIX-SQL menus to produce default reports, or produce original reports by creating your own report specification files, refer to set of INFORMIX manuals. In addition, you will need to refer to the *StarKeeper II* NMS *database schema*, which lists the *StarKeeper II* NMS tables and fields that can be displayed in your custom reports.

For an on-screen description of the logical structure and content of the database, use the *StarKeeper II* NMS **skschema** command. To display the entire *StarKeeper II* NMS database, enter **skschema**. To display selected portions of the database, use the following format:

skschema -s <subsystem> for a specified subsystem or
skschema -t <table> for a specified table

Lists of subsystems and tables can also be displayed using the **-l** option to the **skschema** command. Run **help** for complete cover of the **skschema** entry.

Producing Default Reports

Default reports display the fields of a table that you can select from the *StarKeeper II* NMS database directly on your screen. The INFORMIX-SQL ACE Report Writer, accessed through the INFORMIX-SQL menus, is a tool you can use to produce default reports. You can create a *report specification file*, a file that produces a report, and run the report by working directly with the INFORMIX menus. But first, you must have your database in place, and know which table you want displayed on the report. The basic procedure for creating and running default reports using the INFORMIX-SQL menus is outlined below.



WARNING:

*Do not use INFORMIX-SQL commands to modify data in the StarKeeper II NMS database. There are internal interdependencies among various fields in tables that cannot be reflected when a field is changed with INFORMIX-SQL. You will corrupt the database and may not be able to salvage the data if you modify the database using **isql** commands. You may, however, use INFORMIX-SQL to read data (such as in the Procedure below).*

Procedure 6-7. General Procedure for Producing a Default Report

1. Log in to *StarKeeper II* NMS as cnmsadm". Determine what tables you want to display in your report. (Use the **skschema** command if you want to look at and review any database tables.)
2. Enter **isql** and press to access the INFORMIX-SQL main menu from the SK: prompt.
3. The INFORMIX-SQL MAIN menu is displayed. Select the **report** option in the MAIN menu.
4. The REPORT menu is displayed. Select the **generate** option.
5. The CHOOSE DATABASE screen is displayed. It prompts you to enter a database name. Database names are displayed below the dashed line on the screen. Enter **sk** and press .



NOTE:

The database names are listed. They are followed by @local_se.

6. The GENERATE REPORT screen is displayed and prompts you for the name you want to assign to the report. Enter your choice of name for the report and press .
7. The CHOOSE TABLE screen contains a list of tables in the *StarKeeper II* NMS database. The names of the tables you saw in the database schema appear in the screen below the dashed line. Enter the name of the database schema table you want and press .
8. The REPORT menu is again displayed. Select the **Run** option on the REPORT menu.
9. The RUN REPORT screen is displayed. It prompts you for the name of the report, and lists the report names on the screen, below the dashed line. Enter the name you selected for the report in Step 6 of this procedure and press .

The report is displayed on your screen. To save the report to a file, or print it on the system printer, you have to modify the report specification file for the default report. The report specification file is called *name.ace*, where *name* is the name you selected in Step 6 of the above Procedure. It is created in your home directory. The report specification file was automatically created when you selected the **Run** option in Step 8 of the above Procedure. See **Creating and Printing Reports** in the INFORMIX-SQL manuals for more information on modifying the specification file.

When the report has finished, you are returned to the REPORT menu. Select the **Exit** option, and press . The INFORMIX-SQL MAIN Menu is displayed. Select the **Exit** option, and press to return to the SK: prompt.

Alarm Status Table Report

This example illustrates the process of producing a default report based on the data contained in the *StarKeeper II* NMS alarm_stat table. The alarm_stat table contains active alarm records. To produce the report follow the steps in Procedure 6-8. You must be logged in to *StarKeeper II* NMS as **cnmsadm**.

Procedure 6-8. Producing an Alarm Status Table Report

1. This procedure illustrates the steps necessary to produce a report on the *alarm_stat* table, which is part of the database schema. Enter **isql** and press to access the INFORMIX-SQL main menu from the SK: prompt.

SK: isql

2. Select the **Report** option from the MAIN menu.

```
INFORMIX-SQL: Form  Report  Query-Language  User-menu  Database  Table  Exit
Run, Modify, Create, or Drop a report.
_____ Press CTRL-W for Help _____
```

3. The REPORT menu is displayed. Select the **Generate** option.

```
REPORT: Run  Modify  Generate  New  Compile  Drop  Exit
Generate a default report.
_____ Press CTRL-W for Help _____
```

4. The SELECT DATABASE screen prompts you to enter a database name. Database names are displayed below the dashed line on the screen. Enter **sk** and press .

SELECT DATABASE >>sk

Select a database with the Arrow Keys, or enter a name, then press Enter.
 _____ Press CTRL-W for Help _____

5. The GENERATE REPORT screen is displayed and prompts you for the name you want to assign to the report. Enter the name **almrep** and press .

GENERATE REPORT >>almrep

Enter the name you want to assign to the report, then press Enter.
 _____ sk _____ Press CTRL-W for Help _____

6. Choose the name of the table you want displayed on the report. Table names are listed on the screen below the dashed line. Enter the table name **alarm_stat** and press .

CHOOSE TABLE >>alarm_stat

Choose the table to be used in the default report.

_____ sk _____ Press CTRL-W for Help _____

alarm_log	dk_sched	group_name	mn_except_navail
alarm_stat	dkap_chan	hold_rconct	mn_except_tavail
avail	dkap_mod	htype	mn_except_trk
b_conct	down	isn_node	mn_isn_node
b_continue	dystat	isn_sft	mn_isn_sft
bp_util	err_conn	isn_swt	mn_isn_swt
bsc_mod	err_hold_reconct	isn_trunk	mn_isn_trunk
bsc_port	err_pvc	ml_mod	mn_ml_mod
bsc_term	err_term	ml_port	mn_ml_port
cfg_security	err_up	ml_port_crc	mn_p_conct
conc	except_access	mn_avail	mn_rs_sft
conc_level2	except_conct	mn_bp_util	mn_rs_swt
conn_info	except_navail	mn_cpmm1_mod	mn_sam_mod
conn_stat	except_tavail	mn_cpmm1_port	mn_sam_port
cpmm1_mod	except_trk	mn_dkap_chan	mn_samd1_mod
cpmm1_port	fail_call	mn_dkap_mod	mn_sd1c8_mod
cpmm1_port_crc	fail_signon	mn_except_access	mn_sd1c8_port
dev_lkup	filter	mn_except_conct	...

7. Select the **Run** option on the REPORT menu.

REPORT: Run Modify Generate New Compile Drop Exit

Run a report.

_____ sk _____ Press CTRL-W for Help _____

- The RUN REPORT screen is displayed. It prompts you for the name of the report, and lists the report names on the screen below the dashed line. Enter the name you selected for the report in Step 5 of this procedure and press .

```

RUN REPORT >>alrmrep
Choose a report with Arrow Keys, or enter a name, then press Enter.
_____ sk _____ Press CTRL-W for Help _____
CaLLeng
alrmrep

```

- The following is an example of part of the default report on the *alarm_stat* table as it appears on the screen:

```

nms_type      SK
node_type     DKII
nms_addr      diamond
nmn_addr
node-addr     BJNODE/nj/mtgen/bjnode
cab
shelf
level1
level2
level3
modtype
msgcategory   *C
msgid         LD_CONS
message       Connection between StarKeeper and remote system is down
action
clr_count     1060
cln_count     0
status        0
time_status_sec 665149955
time_status   06:52:35
date_status   01/29/1998
time_update_sec 666048812
time_update   16:33:32
date-update   02/08/1998
time_first_sec 664231567
time_first    15:46:07
date_first    01/18/1998
gmt_adjustment 300
initials
cnt2_flag

```

- When the report has finished, you are returned to the REPORT menu. Select the **Exit** option, and press .

```

REPORT:  Run   Modify  Generate  New   Compile  Drop   Exit
Exit the REPORT menu.
_____ sk _____ Press CTRL-W for Help _____

```

11. Next the INFORMIX-SQL MAIN menu is displayed. Select the **Exit** option, and press to return to the SK: prompt.

```
INFORMIX-SQL: Form  Report  Query_Language  User-menu  Database  Table  Exit
Exit INFORMIX-SQL.
_____ sk _____ Press CTRL-W for Help _____
```

Creating An Original Report

You can create an original report using the *StarKeeper* II NMS Database Schema and the INFORMIX-SQL manuals. Select the tables and fields you want to appear on the report from the database schema, and follow the procedures for **Creating a Custom Report** in the INFORMIX-SQL manuals. If you are experienced in creating *report specification* files, follow the procedures under **Creating a Report From the Command Line**. The following general procedure illustrates how an original report can be produced. You should be logged in to *StarKeeper* II NMS as *cnmsadm*.

Procedure 6-9. General Procedure for Creating An Original Report

1. Determine what tables you want to display in your report. (Use the **skschema** command if you want to look at and review any database tables.)
2. Create a Report Specification file, and compile it using the INFORMIX-SQL menus or from the command line as described in the INFORMIX-SQL manuals.
3. To run the report, select the **Run** option from the REPORT menu if using the menus, or use the **sacego** program described in the INFORMIX-SQL manuals.

Example Original Report

The following example original report specification generates a report on the *node* table. The *node* table supplies information on the network, and local and remote *StarKeeper II* NMSs. To view a display of the *node* table, enter ***skschema -t node***

Determining Table and Fields

The report accesses the *node* table and lists all of the nodes that have been defined, and their corresponding internal node IDs.

Creating a Report Specification File

The ACE report specification file to access the *node* table and select the internal node identifiers is structured as follows:

```
database sk end
select
    node,
    node_id
from node end
format every row end
```

Compiling the Report

To compile the report, enter: ***saceprep node.ace***

Running the Report

To run the report, enter: ***sacego node.ace***

Report Output

The report output lists all the nodes defined in the database and the *StarKeeper II* NMS internal system identifiers. An example follows.

node	node_id
sys1	4
sys2	3
wa/area1/node1	2
wa/area1/node2	1
wa/area2/nodeA	7
wa/abc/billdept	9
mo/wmn/billing	8

Connection Status Report

The *conn_stat* table displays dynamic information about the status of various connections. The original report in this example pulls data from the *conn_stat* table. If you want to refer to the *conn_stat* table, enter ***skschema -t conn_stat***

The report displays three fields from the table:

- Node name
- Connection class
- Status

Connection Status Specification File

The specification file for the connection status report draws data from both the *node* table and the *conn_stat* table. It is created with an OS text editor and saved in a file called *conn.ace*. An example of the specification file structure follows.

```
database sk end
select
    node,
    conn_class,
    status
from node, conn_stat
where conn_stat.node_id = node.node_id end
format
    first page header
    print column 2, "Node Name
        CLASS        STATUS"
    print column 2,
" _____ "
    skip 1 line
    page header
    print "",
    column 2, "Node Name                CLASS        STATUS"
    skip 1 line
    on every row
    print "",
    column 2, node clipped,
    column 39, conn_class clipped,
    column 59, status clipped
    on last row
    skip 1 line
    print "The End"
end
```


Running the conn_stat Report

To execute the report, first compile it by entering **saceprep conn.ace** and press ; then enter: **sacego conn.ace** and press

Connection Status Report Output

The connection status report specification file produces the following output:

Node Name	CLASS	STATUS
NODE1	DKII - CONSOLE	i
starnode	SK - NMS	i
upNODE	DKII - BILLING	m
NODE2	DKII - CONSOLE	i
NODE3	DKII - CONSOLE	m
NODE4	DKII - CONSOLE	m
DKNODE	DKII - CONSOLE	i
ANODE	DKII - BILLING	i
SF/awg/bill.dept	DKII - CONSOLE	i
The End		

Creating Your Own Reports

You can use the example original report in this chapter to pull data from your own tables, or modify them to access different tables.

The INFORMIX documentation is an excellent source of information on creating ACE report specification files. In addition, it contains many useful sample reports.

The maintenance philosophy for *StarKeeper II* NMS is to take steps to avoid problems before they happen. The periodic checks described in this chapter help you achieve continuous and efficient operation of your machine. Also, you should backup software for off line storage after making any significant changes; if problems occur, the software can be restored. If problems do occur, they usually fall into one of two categories: obvious problems that require corrective maintenance and not-so-obvious problems that require troubleshooting to determine the cause of the problem.

To prevent operational problems with *StarKeeper II* NMS, perform periodic checks to determine the health of your machine and take steps to avoid potential problems. Periodic checks, described in this chapter, include checking the Event Log files, clearing alarms, maintaining the database, and conserving disk space.

Two *StarKeeper II* NMS commands, **skbackup** and **skrestore**, permit backup and restoration of the entire software environment, or selected portions, or uploaded files from specified network nodes. Corrective maintenance procedures include fixing installation problems, connection problems, problems with start-up, and recovering from a system crash. Troubleshooting procedures are included to inform you how to check the active processes, database corruption, and examine message queues.

Periodic Checks

Preventing problems before they occur is the best way to maintain *StarKeeper II* NMS. Certain checks should be done periodically to avoid potential problems. The periodic checks you should perform are the subject of the following sections. How often these checks should be performed depends on the system size; the larger the system, the more frequently these checks should be performed.

Checking Event Log Files

To monitor the sanity of *StarKeeper II* NMS, periodically look through current files in *\$EVENTLOG*. The *EVENTLOG* files tell you if anything is malfunctioning with *StarKeeper II* NMS itself.

To check the log files, for example, go to the *EVENTLOG* directory by entering the OS **cd** command: **cd \$EVENTLOG**. Once in the *EVENTLOG* directory, get a list of the log files by entering the OS **ls** command. (Refer to **Chapter 5, Procedure 5-11** for complete instructions.) To look at the tail end of the current log file, enter the following OS command:

```
tail -40 <yymmdd.sequence_file>
```

This command displays the last 40 lines of messages that came into the log file. Each message usually takes a few lines. By examining the Event Logs periodically, you can monitor the performance and state of *StarKeeper II* NMS. See **Appendix J** for a list of SCP Error Codes that you may find in your Event Log.

⇒ NOTE:

If more than 9 log files collect within a single day, check the *MAXFSIZE* file by entering the following.

```
echo $MAXFSIZE
```

The system responds with a message giving the size; for example:

```
200000
```

It should be set to 200000. (The actual number is slightly larger than 200000—this is a rounded value.) If the *MAXSIZE* was changed to a smaller number, change it back to the recommended 200000; a smaller number is a problem.

To change the *MAXFSIZE*, you must be logged in as *root*. Enter *su* and supply the root password. Modify the *\$CNMS_ROOT/etc/env/cnms* file, using an OS editor such as **vi**, by changing the *MAXFSIZE* line to equal the number you want; for example, **MAXFSIZE=200000**. To have the change take effect, shut down and restart *StarKeeper II* NMS (**Chapter 3**).

Clearing Alarms

StarKeeper II NMS has four categories of alarms: informational, minor, major, and critical. Informational alarms are cleared as they are received. Active minor alarms are cleared daily at midnight. Active critical and major alarms are retained for a specified number of days before being cleared, as set by the **Alarm Management** function (see **Chapter 3**).

To prevent the system from being flooded with alarms, clear them as they are coming in. We recommend you clear alarms node-by-node instead of all at once.

Turn off the **alarms** process (enter *noalarms*) or exit the **netdisp** process if the processes are not being used. Alarms can be cleared manually and some are automatically cleared. All clearing methods are explained in **Chapter 5**, the section titled **Clearing of Alarms**.

Database Maintenance

StarKeeper II NMS collects alarms, billing, and performance data and stores the data in tables in the *\$CNMS_DBS* directory, using subdirectories *ahp*, *bill*, *per*, and *per2*; configuration data is stored in *cfg*. Each table grows with the frequency that data is collected from the network nodes.

Proper database maintenance is necessary for an efficient *StarKeeper II* NMS. As the database grows, disk space on your host computer is being used up. Although you allocated a large amount of disk blocks before operation began, these disk blocks are easily used up if you do not take care in monitoring and cleaning up the database. For example, if a substantial amount of billing traffic occurs on your network nodes, the *StarKeeper II* NMS database billing tables grow quite large. Also, if you schedule hourly performance reports on your nodes, performance data accumulates quickly in the performance tables.

Monitoring the Growth of Database Tables

The *MSGLOG* files tell you the type of alarms that are coming into the *StarKeeper II* NMS. This data is stored in the *StarKeeper II* NMS database. The user can use the *MSGLOG* files to gauge the amount of data that is going into the database by seeing how fast the log files are growing.

If you have a network where the database grows rapidly and unpredictably (such as with alarms), then write a script that determines the size of the database on a nightly basis and sends mail to the appropriate person when a certain threshold is reached. This script could include the command **du -s \$CNMS_DBS**, which gives the total blocks used by the database. Also the size of individual files in the database can be checked periodically to determine if they are growing uncontrollably. To regain space, see the sections titled **Cleaning up Database Tables** and **Regaining Disk Space**. If tables are consistently growing large, you may need to re-engineer the system; see the *Planning Guide*.

Cleaning up Database Tables

StarKeeper II NMS has routines to delete old database records that are resident in the database for a certain number of days. This "certain number of days" is the *retention period* that you can change for alarm, billing, and performance data. The retention period specifies how long data is to be held before it is deleted as *old data*.

For example, the default value for the billing data retention period is three days. Billing data older than three days is automatically deleted. Consider shortening the retention period if these files fill up quickly, or change the frequency of reporting to keep the files from growing too fast. Refer to Table 7-1 and the list on the next page for instructions.

⇒ **NOTE:**

Nightly clean up of database tables removes data, but does not recover disk space. The space is replaced by a null entry holding that space for the next database entry. To remove the null space, and thereby recover disk space, refer to the **Regaining Disk Space** section.

To change the retention period for performance data, use the RETNMGMT function available via **SKsh**. Refer to the **Performance Measurements Management (PERFMGMT)** section in **Chapter 3**. If the parameters available via RETNMGMT do not meet your needs, modify the *\$INPUT/sk.ctl* file.

Table 7-1. Data Retention and Cleanup Parameters

Type of Data	Control File	Control Variable and Default	Interpretation
alarms	<i>\$INPUT/almctl</i> (see note below)	RETAIN (default is 1)	Locally-originating outstanding alarms more than \$RETAIN days from the day cleanup is run is deleted from the alarm_stat table.
billing	<i>\$INPUT/billctl</i>	DEL_TIME (default is 3)	If DEL-TIME = 3, then data from the last 3 days plus the morning are retained.
performance	<i>\$INPUT/sk.ctl</i>		Performance tables in the database are cleaned up depending on the entry for that table in <i>sk.ctl</i> . The number of days for a table is obtained by multiplying “intvl” by “days” for that table entry. The records in the table are deleted if the age of the record is equal to or greater than the number of days obtained above.
log files	<i>\$INPUT/disk_mon</i>	LOG (default is 2)	Files are removed when they reach an age of LOG or greater.

⇒ **NOTE:**

For alarms, RETAIN applies to alarm_stat only. The alarm_log table is deleted each night when alarm_clean is run. The sk.ctl file controls dystat, wkstat, and mnstat.

<i>alarm</i>	To change the <i>retention period</i> for critical and major alarms, refer to the Alarm Management section of Chapter 3 . A retention period of RETAIN=-1 means the alarms will not be deleted during alarm cleanup.
<i>billing</i>	To change the <i>retention period</i> for billing, refer to the Billing Management section of Chapter 3 .
<i>performance</i>	To change the retention period for performance data, you may use the RETNMGMT function available via SKsh . You may also do this by modifying the <i>\$INPUT/sk.ctf</i> file. <i>Reporting Period</i> is daily, weekly, or monthly, as performed by p_summary , which outputs its summary status to the <i>\$DATAFILES/p_summary.night</i> file.

Cleanup Diagnostics

Look at the diagnostic files (Table 7-2) daily to see if the nightly cleanup processes ran properly.

Table 7-2. Cleanup Diagnostic Files

Process	Diagnostic File
alm_clean (alarms)	<i>\$DATAFILES/alm_clean.night</i>
b_delete (billing)	<i>\$DATAFILES/b_delete.night</i>
cnms_clean (performance)	<i>\$DATAFILES/clean.night</i>
p_summary (performance)	<i>\$DATAFILES/p_summary.night</i>

The processes in Table 7-2 delete old data from the *StarKeeper II* NMS database and send status messages to the appropriate diagnostic file. To see the status messages, enter the following command lines, from the SK: prompt.

```
cat $DATAFILES/alm_clean.night
cat $DATAFILES/b_delete.night
cat $DATAFILES/clean.night
cat $DATAFILES/p_summary.night
```

If the files scroll off the screen, use the **pg** command instead of **cat**.

If the nightly cleanup was not executed, verify that the process **cron** is still alive, by entering the following command: **ps -ef | grep cron**. An example output from this command is shown below:

```
root      128      1    0      Jan 29   ?        0:04  /usr/sbin/cron
cnmsadm   26313  18670  1    11:07:30 ttyp 3   0:00  grep /usr/sbin/cron
```

The first line above shows the cron process is running.

The **cron** process should never die; enter **ps -ef** to see if it still exists. If it does, shut down *StarKeeper II NMS* (**Chapter 3**), and reboot the OS (which automatically restarts *StarKeeper II NMS*). Resetting the cron is a standard OS procedure, refer to the appropriate *Operating System Manual* for detailed procedures.

Regaining Disk Space (The RSPACE Utility)

When a record is deleted from a database table (see previous subsections **Cleaning Up Database Tables** and **Cleanup Diagnostics**), it is “nulled” out. Therefore, even though cleanups have occurred, the physical space in the file system is not recovered. Instead, a null space exists for each deleted record in a table. These null records are filled by the next set of records entering the table. If a *StarKeeper II NMS* database table does not have null records, an incoming record is appended at the end of the table; but, if null records do exist in the table, then an incoming record is inserted into the first available null slot.

Keep null table entries down to a minimum. A null entry search may increase the time required by *StarKeeper II NMS* to perform database transactions. A lot of null entries can be created if the number of console, billing, administrative, or performance connection are reduced or if the retention periods of the cleanup routines are reduced. Also, if the number of nodes monitored is reduced, less data is coming into the *StarKeeper II NMS* database to occupy the null entries.

The *StarKeeper II NMS* routine called RSPACE regains the physical disk space used by the null table entries. RSPACE can be accessed from the DBUTILS Menu (as explained in Procedure 7-1). Essentially, RSPACE compresses the specified tables and removes all null entries.



CAUTION:

Do not attempt to regain disk space by manually removing (the OS rm command) database tables. Doing so will leave your database in a corrupted state.

When to Use RSPACE

Run the RSPACE utility (see Procedure 7-1) whenever any of the following conditions have occurred:

- before backing up a database
- when the retention periods for performance, billing, or alarms data are reduced
- when the number of active node connections is reduced
- when the number of nodes being monitored is reduced

We recommend that the RSPACE utility is run on periodically for all tables. Run RSPACE if the amount of physical disk blocks in the *StarKeeper II* NMS file system starts to get depleted rapidly. For example, if 70% of the disk blocks in the file system are in use, then run RSPACE to try to recover disk blocks.

 IMPORTANT:

StarKeeper II NMS must be shut down before the RSPACE utility is run. The RSPACE utility must never be started to run concurrently with the nightly clean-up processes (which run even if *StarKeeper II* NMS is shut down). If the RSPACE utility is run at the same time as the nightly clean-up processes, some data may not be summarized or cleaned up, or database corruption can occur, causing data loss and application down time.

How to Run RSPACE

To run the RSPACE utility, follow the steps in Procedure 7-1.

Procedure 7-1. How to Regain Disk Space

1. Use the OS **df -t** command to determine available disk space. Refer to the **Manual Monitoring of Disk Space** subsection in the **Conserving Disk Space** section of this chapter for details. Record the amount of disk space in use.
2. Shut down *StarKeeper II* NMS using SHUTSK on the DBUTILS Menu.
3. To access the DBUTILS Menu, enter **SKsh** at the SK: prompt, choose SYSADM at the Main Menu; DBUTILS from the SYSADM Menu; then RSPACE from the DBUTILS Menu (minimum entry is **r**) as shown below.

StarKeeper II (R) Network Management System - Selection Menu			
Select	Description	Menu: dbutils	Level: 3
INITDB	Initialize the <i>StarKeeper II</i> NMS Database and Tables		
RSPACE	Regain Space From Database Tables		
STARTSK	Startup <i>StarKeeper II</i> NMS		
SHUTSK	Shutdown <i>StarKeeper II</i> NMS		

Enter a selection (or ?selection for help) and press RETURN

Screen 7-1. DBUTILS Menu

4. The RSPACE utility cannot be run while the nightly clean-up processes are in progress. If it is started at this time, the RSPACE utility will exit with the following message:

The RSPACE utility cannot be run concurrently with the nightly processes. Please run RSPACE at another time of day. Refer to the Database Maintenance section of the Core System Guide for additional details.

Screen 7-2. RSPACE Message

5. The system displays the RSPACE utility menu (as follows).

```
DISK SPACE RECOVERY (RSPACE)
-----
Recover space from:
1. Performance Tables
2. Billing Tables
3. Alarm Tables
4. Configuration Tables
5. QUIT
Enter selection(s) (e.g. 1 or 1,2):
```

Screen 7-3. RSPACE Utility Menu

6. Decide from which tables you want to recover disk space. Select the appropriate number(s) on the menu and press . (For example, enter **1,3** and press to run RSPACE on the Performance and Alarm tables.)
7. At this point, RSPACE will calculate how much free disk space it needs to run. A message similar to the one below will be displayed:

35679 free blocks are needed to run RSPACE

Screen 7-4. RSPACE Disk Space Message

8. If there is not enough free space in `/usr2` for the temporary files created by RSPACE, then you will be prompted for another file system as shown below:

```
The "/usr2" file system does not have enough free disk space
for the temporary files created by RSPACE. You could either
quit or specify another filesystem for the temporary
files created by RSPACE.
Do you want to continue [y, n, q] ? y
Specify a directory in another filesystem to be used for the
temporary files created by RSPACE: /tmp
```

9. The following message appears— and repeats for each table set selected:

```
**** Attempting to recover deleted space from <table set name> ****
      "      "      "      "      "      <table name>
      "
      "
      "
```

Screen 7-5. RSPACE Confirmation Message

10. As space is recovered from each of the tables in the set, the following message appears:

Successfully regained deleted space from <tablename>

If *StarKeeper II* NMS is running, you may receive the following message:

```
**** Warning Unable to regain deleted space from <tablename>
```

This generally results from contention for the requested tables. If you are running the RSPACE utility in the early morning hours, it may be contending with summarization or clean-up processes. You should wait until system activity has slowed before running RSPACE.

If RSPACE is run and any of the database *.dat* files is missing, this message is displayed:

```
$CNMS_DBS/xxxx/xxxx.dat: No such file or directory.
Program terminates due to a fatal error!
```

In the preceding example, an expected file did not exist. If this occurs, there may be database corruption; refer to the **Troubleshooting** section later in this chapter. Or, if RSPACE is run and any of the database *.idx* files is missing, this message is displayed:

```
$CNMS_DBS/xxxx/xxxx.idx: No such file or directory.
Program terminates due to a fatal error!
```

In the preceding example, an expected file did not exist. If this occurs, there may be database corruption; refer to the **Troubleshooting** section later in this chapter.

11. When RSPACE has completed, you receive the following message:
- ```
RSPACE Utility run has completed
```
12. Restart the *StarKeeper II* NMS; use the STARTSK choice on the DBUTILS Menu of the SKsh.
13. Repeat Step 1 and compare the readings.



#### CAUTION:

*Use RSPACE with care. The file system where \$CNMS\_DBS resides must have the same number of free blocks available as the largest table that RSPACE is being run against plus 10 percent. For example, if the largest table in \$CNMS\_DBS/ahp is 5 Megabytes, then /usr2 must have: 5 Mbps plus 10 percent of the 5 Megabytes of free space. This is one reason you*

*must track the size of \$CNMS\_DB\$ before it gets too large. The host machine must have enough space to regain space.*

## **Conserving Disk Space**

---

Disk space is a limited resource in the *StarKeeper II* NMS. If this resource is not monitored carefully, the performance of the OS and the *StarKeeper II* NMS may degrade over a period of time. Although there are automatic processes that monitor and clean disk space (described below), you also must be diligent to conserve this resource.

The number of available disk blocks in the *root* file system must never go below 1000 blocks; if it does, *StarKeeper II* NMS shuts down. Whenever *StarKeeper II* NMS uses INFORMIX, temporary files are written to */usr/tmp*; therefore, it is important to ensure that */usr* has enough free disk blocks for INFORMIX to do its work. The disk monitor (see next subsection) issues warnings when certain file systems reach an established low level. The levels for "First Warning" and shutdown are shown in the table below. Refer to the **Manual Monitoring of Disk Space** section, which follows, for instructions on how to check disk space.

| File system                     | First Warning | Shutdown     |
|---------------------------------|---------------|--------------|
| <i>root</i>                     | 3000 blocks   | 1000 blocks  |
| <i>/usr</i>                     | 5000 blocks   | 1000 blocks  |
| <i>/usr2/SK/r10.0/datafiles</i> | 20000 blocks  | 3000 blocks* |

\* At 7000 blocks of free disk space, the Performance Collector and the Billing Collector processes will shut down.

## **The Disk Monitor**

The disk monitor checks for low disk space and cleans up old files. It is started by the *StarKeeper II* NMS monitor at initialization and runs until the system is shut down.

The disk monitor:

- Warns when free disk space falls below a certain level (see table above)
- May invoke the disk cleaner (see next section) to regain free disk space by removing files if free disk space gets low. The following files are cleaned up:
  - Message Log files
  - Console Log files
  - Event Log files
  - Session Maintenance Log files

- May shut down the operation of the Performance Collector process (pcollect) and the Billing Collector process (bcollect) to preserve free disk space on the \$DATAFILES file system. This takes place when the free disk space is lower than the block number of LEVEL3, which by default is 7000 blocks, as defined in \$INPUT/disk\_mon. When this happens you need to clean up the file system identified in the alarm message and restart the two processes. The help file for this alarm (30040) has details on how to restart the two processes.

## Disk Monitor Messages

Free disk space is checked at regular intervals. If free disk space is disappearing, the disk monitor takes appropriate action to free more disk space. The disk monitor has no memory of its previous actions, so the Event Log may receive the same message several times in a row.

1. If free disk space falls below the minimum, the following alarm report message is sent to the Event Log:

```
30001 ** REPORT CNMSMSG Disk Monitor: Free disk space for /
usr2/SK/r10.0/<directory name> is only 8150 blocks
```

2. When files older than today's files are removed because disk space is low, the following message is issued to the Event Log:

```
Free disk space in file system <name> at <size> blocks.
```

3. After that message appears, the following message is issued to the Event Log each time a file is removed:

```
File <full-pathname>/<filename> removed by the disk monitor to
regain disk space.
```

4. When the Performance Collector process and the Billing Collector process are terminated, the following message is issued:

```
30040 *C REPORT CNMSMSG Disk Monitor: Disk monitor cannot
regain space for /usr2/SK/r10.0/<directory name>. The
Performance Collector process (pcollect) and the Billing
Collector process (bcollect) have been shut down and will no
longer be functioning. Please clean up the file system then
restart the processes.
```

In this message, <\$DATAFILES> is the file system where all the data files are stored.

5. After that message, another one appears as each file is removed:

```
File <full-pathname>/<filename> truncated by the disk monitor
to regain disk space.
```

6. The following message is issued when the *StarKeeper* II NMS is shut down because of low disk space:

Free disk space in file system <name> at <size> blocks. Disk monitor cannot regain space in file system. StarKeeper is being shut down. Clean up and restart StarKeeper.

## Disk Cleaner

The disk cleaner runs once a day and deletes old logs and records in the databases. The following message is written to the Event Log each time the disk cleaner removes a file.

File <full-pathname>/<filename> removed by cnms\_clean.

## Manual Monitoring of Disk Space

To check disk space usage, enter the OS **bdf** command. A listing of the current block size as well as the total number of blocks available for the file systems is displayed.

*StarKeeper* II NMS notifies you via an alarm message when disk space is disappearing. If customers have been given the ability to access reports with the **Permit** command (see the **Command Partitioning** section of **Chapter 3**), be certain they are deleting their old reports (with their **pr.remove** subcommand which is part of the **PrntOpt** command). If left undeleted, this consumes a great amount of disk space.

Below is an example of the type of alarm message that would appear on the screen:

30002 REPORT CNMSMSG Disk Monitor: Free disk space in file system  
<name> is below <num> blocks

### Screen 7-6. Low Disk Space Alarm Screen

If disk space is low, run the OS **du** command to display the number of blocks used per file. Look for unneeded user files and remove them, using the OS **rm** command.

## Directories that Grow

The following directories contain log files that grow daily:

\$EVENTLOG  
\$MSGLOG  
\$CONSLOG  
\$SMLOG (*only if session maintenance is configured*)  
\$ADMINLOG

Log files are generated every day in the above directories and it is best that they get cleaned out within a certain amount of time. The default retention period is two days, so any log file older than two days is automatically removed from the file system by the disk clean process. To change the retention period, you have to change the LOG entry in the *\$INPUT/disk\_mon* file to the desired retention period. You also must shut down and restart *StarKeeper II NMS* for the change to take effect. (Refer to **Chapter 3**.)

## **Backup and Recovery of Your *StarKeeper II NMS* Data Files**

---

Beginning with R8.0, *StarKeeper II NMS* can be configured on a 2-GB disk. This allows collection and storage of more data than in previous releases. The **skbackup** and **skrestore** commands have been enhanced to allow for the use of either a Fast tape drive (F) or disk-to-disk (D) in addition to the support for the tape drive (R) that comes with your hardware configuration. The **-x** option, has been added to allow you to specify which method you wish to use.

The *StarKeeper II NMS* will experience a certain amount of downtime during backup operations depending on the amount of data and the hardware option chosen. The following section shows how to estimate the amount of data you will be backing up and the time it will take for the backup.

### **Data Transfer Rates**

---



#### **NOTE:**

You must be logged in as **cnmsadm**.

Backup times are dependent on hardware used. For the standard 4mm DDS-1 tape drive (the R option), backup is the same as it has been in previous releases (however, with the HP 715 tape drive and using a 90 meter tape, the user can back up the 2-GB database). The fast tape drive (F option) uses the 4mm DDS-2 format tape drive or a 4mm DDS-3 format tape drive with a transfer rate of approximately 2.45 GB/hr (approximately three to four times as fast as the R option). The D option (roughly twice as fast as the F option) requires configuration of an external hard disk. After performing a backup using the D option, you can transfer the data from the external drive to removable media; the transfer does not require any downtime, therefore, you can use either the regular or fast tape drive.

### **Calculation Examples**

To estimate the time required to backup the performance subsystem database, execute the following commands at the SK: prompt.

```
cd $CNMS_DBS
du -s per per2
```

The **du** command returns values for the performance data directories: **per** and **per2**. Add the two values together to obtain the blocks of data in the performance subsystem database. For example, if **du -s per per2** returns:

```
98942 per
79647 per2
```

Add to obtain **178589** 512-byte blocks of performance data. Multiply this result by 512 and divide by the hourly transfer rate to obtain the time estimate. The transfer rate depends on the hardware; under average load conditions:

- regular tape drive = 660MB/h (21480 512-byte blocks per minute)
- fast tape drive = 2.45 GB/h (79750 512-byte blocks per minute)

It is harder to predict the disk-to-disk rate because this option depends on a variety of parameters. However, the result of testing shows that under average conditions you can expect a rate roughly twice as fast as for the fast tape drive.

Using the number **178589** obtained above, the estimated time using the regular tape drive is:

$(178589 \text{ blocks} \times 512 \text{ bytes per block} \times 60 \text{ minutes per hour}) / 660,000,000 \text{ bytes/h}$

The result is between 8 and 9 minutes. If **du -s per per2** gave 1,000,000 blocks, the time would be  $(1,000,000 \times 512 \times 60) / 660,000,000$  or about 47 minutes.

To estimate the amount of data to be transferred using the **-e** option (environment files) for **skbackup**, issue the **du -s** command on the home directories of **cnmsadm** and all **Permit** users.

To estimate the amount of data to be transferred using the **-l** option (log files) for **skbackup** execute (at the SK: prompt):

```
cd $DATAFILES/logs
du -s conslog eventlog msglog
```

To estimate the amount of data to be transferred using **-n** (saving files uploaded from nodes using the upload utility) for **skbackup**, locate the uploaded files:

```
cd $INPUT
cat uldl | pg
```

A line such as **BASEDIR=/usr2/SK/uldl** should appear. (**/usr2/SK/uldl** is a default; it may have been changed). Assuming **BASEDIR=/usr2/SK/uldl**, follow these steps if you are using the **-n** option with the value **all**, otherwise specify the node names after **-s** in the **du -s** command.

```
cd /usr2/SK/uldl
du -s
```



In each of the previous cases, estimate the time (in minutes) needed for backup using the standard tape drive by dividing by 21480.

For the “Fast” tape drive (F), estimate the time needed by dividing the **du** results by 79750. For disk-to-disk, divide by 159500. *In all cases, these are estimates.* The actual time may vary depending on the level of activity on your machine.

The above examples provide a way to gauge the time interval needed to backup an existing database. If you are planning to expand your network using your existing *StarKeeper II* NMS or to deploy new *StarKeeper II* NMS systems in your network, you must use the *StarKeeper II* NMS Configurator Tool to estimate disk space usage. You will have to provide projections for the nature of the network components to be managed by the Core System as well as some information about the system itself. Once you provide that information to the tool, you can get a report of the tool's estimate for disk space consumption, based on the parameters you provided. Take that disk space information and treat it as millions of bytes, dividing by the transfer rate to get the time required for a backup. As an example, consider a *Disk Requirement Report* that shows the following.

| Function                    | Disk 1  | Disk 2   |
|-----------------------------|---------|----------|
| Unix (Operating System)     | 270.000 |          |
| Unix (Swap Space)           | 200.000 |          |
| Core System                 |         | 58.379   |
| Appl. (NM/PR/NB/SNMP)       |         | 9.234    |
| Up/Download Files           |         | 13.410   |
| Alarm DB                    |         | 25.827   |
| SVC Billing DB              |         | 8.324    |
| PVC Billing DB              |         | 6.564    |
| Configuration DB            |         | 0.762    |
| Performance day DB          |         | 487.965  |
| Performance week/month DB   |         | 865.509  |
| Total Required (Mbytes) ==> | 470.000 | 1475.974 |

The total includes space that would never be backed up using **skbackup**. Therefore, add the numbers starting with “Alarm DB” to get 1394.951. Then find the expected time interval by:

$1394951000 \text{ bytes} \times 60 \text{ minutes per hour} / 6600000000 \text{ bytes per hour}$

This results in an interval of 127 minutes using the regular tape drive.

## Data File Backup Procedures

---

You should back up the database (and other critical data files) after making significant changes to the data. This backup copy resides on either a 4mm DDS cartridge tape that is 60 meters long, or a 4mm DDS cartridge tape that is 90 meters long. In addition, you must keep the backup copy in a safe place so that you can restore the data in the event it gets corrupted. For databases larger than 1 GB, the 90 meter tape should be used. To back up data files, follow the steps in the following procedure.

### Procedure 7-2. How to Backup *StarKeeper II* NMS Data Files

---

Follow the steps below to back up the entire database on a 4mm DDS cartridge tape that is 90 meters long.

1. Shut down *StarKeeper II* NMS (**Chapter 3**).

#### **NOTE:**

If you are only backing up ICI configuration data, it is not necessary to shut down the system. The **skbackup** command enables you to back up the configuration database while *StarKeeper II* NMS is up and running with the **-c** and **-f** options. However, **skbackup** should not be run with the **-c** and **-f** options when updates to the configuration database are being applied via **cfg\_sync**, the **cf** commands, or Network Builder application configuration forms.

2. Load the appropriate cartridge tape, if necessary depending on hardware option, on the *StarKeeper II* NMS host. Wait for the front panel lights to stop blinking.
3. At the SK: prompt, enter the following command: **skbackup -d** or **skbackup -d -x F** if using the fast tape drive or **skbackup -d -x D** if using the disk-to-disk option. (Note that **-x R** which specifies the regular tape drive is unnecessary because the regular tape drive option is the default.)
4. When using one of the tape drive options, be sure to label the cartridge tape and store it in a safe place.

The **-d** option specifies the entire database. The **-x** option to the **skbackup** command specifies the hardware type. Other options are available to specify certain portions of the database or to specify other data file entities. Options also specify *where* the data is to be backed up to: another directory or another directory *and* a cartridge tape. More than one option can be specified on the command line.

An abbreviated list of options appears in Table 7-3 followed by a matrix showing the allowed combination of **skbackup** options; run **help** for complete information.

**Table 7-3. skbackup Command Options**

| Option                     | Description                                                                                                                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>-xF or -xD or -xR</b>   | Specifies the fast (F) tape, disk-to-disk (D), or regular (R) tape option. If the <b>-x</b> option is <i>not</i> used, the system defaults to the <b>R</b> option. The <b>-x</b> option assumes the appropriate hardware has been added and configured. |
| <b>-d</b>                  | entire database                                                                                                                                                                                                                                         |
| <b>-p</b>                  | performance data tables                                                                                                                                                                                                                                 |
| <b>-b</b>                  | billing tables                                                                                                                                                                                                                                          |
| <b>-c</b>                  | configuration data                                                                                                                                                                                                                                      |
| <b>-c H</b>                | configuration data tables (to the <code>\$CNMS_DBS/cfg_save</code> directory)                                                                                                                                                                           |
| <b>-c HR   -c RH</b>       | configuration data tables using the regular tape drive (to <code>\$CNMS_DBS/cfg_save</code> directory <i>and</i> cartridge tape) <b>R</b> and <b>F</b> cannot be used together.                                                                         |
| <b>-c HF   -c FH</b>       | configuration data tables using the fast tape drive (to <code>\$CNMS_DBS/cfg_save</code> directory <i>and</i> the cartridge tape). <b>R</b> and <b>F</b> cannot be used together.                                                                       |
| <b>-e</b>                  | the NMS environment                                                                                                                                                                                                                                     |
| <b>-f</b>                  | force; when used with <b>-c</b> , <i>StarKeeper II</i> NMS can be up and running except when configuration updates are being applied via <b>cfg_sync</b> , the <b>cf</b> commands, or Network Builder application configuration forms.                  |
| <b>-l</b>                  | log files (Message, Event, Console, Session Maintenance Logs)                                                                                                                                                                                           |
| <b>-n &lt;nodename&gt;</b> | the uploaded files from node databases specified network nodes. A comma-separated list of node names or <i>all</i> .                                                                                                                                    |
| <b>-i H</b>                | ICI configuration tables (to <code>\$CNMS_DB/cfg_save</code> directory). See <b>/Note</b> .                                                                                                                                                             |
| <b>-i HR   -c RH</b>       | ICI configuration tables using the regular tape drive (to the <code>\$CNMS_DB/cfg_save</code> directory and to the cartridge tape).                                                                                                                     |
| <b>-i HF   -c FH</b>       | ICI configuration tables using the fast tape drive (to the <code>\$CNMS_DB/cfg_save</code> directory and to the cartridge tape).                                                                                                                        |

### ⇒ NOTE:

The ICI tables are a subset of the configuration data, therefore, the **-c** option can be used to backup these tables. However, if ICI data is being maintained, it is critical to keep frequent, incremental backups of the ICI configuration after updates, rather than waiting for less-frequent full configuration backups. This is necessary because *StarKeeper II* NMS contains the ICI configuration data master copy and, unlike other configuration data, the information cannot be retrieved from the node's database. Unlike **-c**, *StarKeeper II* NMS need not be shut down for the **-i** option to execute.

The matrix below shows the allowed combinations of **skbackup** options. *Yes*: means options can be used together; *no* means they cannot; *ig.* means the **-i** option is ignored but processing continues on the other option in the combination.

| options | -x  | -d              | -p  | -b  | -e  | -f  | -l  | -c  | -i  | -n |
|---------|-----|-----------------|-----|-----|-----|-----|-----|-----|-----|----|
| -x      | -   | yes             | yes | yes | yes | no  | yes | yes | yes | no |
| -d      | yes | -               | no  | no  | yes | no  | yes | yes | ig. | no |
| -p      | yes | no              | -   | yes | yes | no  | yes | yes | ig. | no |
| -b      | yes | no              | yes | -   | yes | no  | yes | yes | ig. | no |
| -e      | yes | yes             | yes | yes | -   | no  | yes | yes | ig. | no |
| -f      | no  | no              | no  | no  | no  | -   | no  | yes | no  | no |
| -l      | yes | yes             | yes | yes | yes | no  | -   | yes | ig. | no |
| -c      | yes | yes             | yes | yes | yes | yes | yes | -   | ig. | no |
| -i      | yes | --- ignored --- |     |     |     |     |     |     | -   | no |
| -n      | no  | no              | no  | no  | no  | no  | no  | no  | no  | -  |

### ⇒ NOTE:

*StarKeeper II* NMS must be shut down for all options except **-i** and **-n**, and **-t** and **-f**.

## Data File Restore Procedures

Use **skrestore** to restore corrupted data, as shown in the procedure below.

To avoid any read/write errors during the data restoration process, make sure the heads of the tape drive were recently cleaned. HP recommends frequent use of the HP DDS cleaning cartridge in order to avoid data corruption and or data corruption error messages.

### Procedure 7-3. How to Restore *StarKeeper II* NMS Data Files

Follow the steps below to restore the database from a cartridge tape.

1. Shut down *StarKeeper II* NMS (see **Chapter 3**).
2. Load the cartridge tape containing the *StarKeeper II* NMS database on the host computer. Wait for the front panel lights to stop blinking.
3. At the SK: prompt, enter **skrestore -d** or **skrestore -d -x F** (fast tape) or **skrestore -d -x D** (disk-to-disk), depending on the **skbackup** option used.

The **skrestore -x** option specifies the hardware type. **-d** specifies the entire database. Other options are available to specify certain portions of the database or other data file entities. Options also specify from *where* the data is to be backed up: `$CNMS_DBS/cfg_save` directory or a cartridge tape. More than one option

can be specified on the command line. An abbreviated list of options appears in the table below; run **help** for complete coverage of the **skrestore** entry.

**Table 7-4. skrestore Command Options**

| Option                               | Description                                                                                                                                                                                                                                      |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>-d</b>                            | entire database                                                                                                                                                                                                                                  |
| <b>-l</b>                            | log files (Message Logs, Event Logs, Console Logs, Session Maintenance Logs)                                                                                                                                                                     |
| <b>-v</b>                            | prints tape contents information from when <b>skbackup</b> was done                                                                                                                                                                              |
| <b>-c H</b>                          | configuration data tables (from <i>\$CNMS_DBS/cfg_save</i> directory)                                                                                                                                                                            |
| <b>-c R or -c F</b>                  | configuration data tables using the <b>Regular</b> or <b>Fast</b> tape drive (from the cartridge tape). The <b>R</b> and <b>F</b> option cannot be mixed in the same command.                                                                    |
| <b>-e</b>                            | the NMS environment                                                                                                                                                                                                                              |
| <b>-n</b><br><b>&lt;nodename&gt;</b> | files from specified network nodes. A comma-separated list of node names or <i>all</i> .                                                                                                                                                         |
| <b>-i H</b>                          | ICI configuration tables (from the <i>\$CNMS_DB/cfg_save</i> directory). This cannot be used with any other option.                                                                                                                              |
| <b>-i R or -i F</b>                  | ICI configuration tables using the <b>Regular</b> or <b>Fast</b> tape drive (from the cartridge tape). This cannot be used with any other option. The <b>R</b> and <b>F</b> option cannot be used together.                                      |
| <b>-xF or -xD or -xR</b>             | Specifies the fast (F) tape, disk-to-disk (D), or regular (R) tape option. If the <b>-x</b> option is not used, the system defaults to the <b>R</b> option. The <b>-x</b> option assumes the appropriate hardware has been added and configured. |

The matrix below shows the allowed combinations of **skrestore** options. *Yes*: means options can be used together; *no* means they cannot; *ig.* means the **-i** option is ignored but processing continues on the other option in the combination.

| options | -x  | -d  | -v  | -e              | -l  | -c  | -i  | -n  |
|---------|-----|-----|-----|-----------------|-----|-----|-----|-----|
| -x      | -   | yes | yes | yes             | yes | yes | yes | no  |
| -d      | yes | -   | yes | yes             | yes | no  | ig. | no  |
| -v      | yes | yes | -   | yes             | yes | yes | yes | yes |
| -e      | yes | yes | yes | -               | yes | yes | ig. | no  |
| -l      | yes | yes | yes | yes             | -   | yes | ig. | no  |
| -c      | yes | no  | yes | yes             | yes | -   | ig. | no  |
| -i      | yes | ig. | yes | --- ignored --- |     |     | -   | no  |
| -n      | no  | no  | yes | no              | no  | no  | no  | -   |



**NOTE:**

*StarKeeper II* NMS must be shut down for all options except **-i** and **-n**.

## **Backup and Recovery of Your *StarKeeper II* NMS System**

---

It is extremely important to back up your *StarKeeper II* NMS system regularly. In the event of a disk problem, accidental deletion of files or data loss due to a disaster, your backup tape allows you to recover data that would have otherwise been permanently lost. The following subsections provide procedures for:

Recommended backup strategy

Backing up your system

Restoring data from backup

Installing HP-UX on a new disk

In addition to these subsections, the subsection that follows provides pointers to the procedures required to recover from some critical situations.

### **In Case of Emergency Recovery**

This section provides a brief description of “what to do” to recover from emergency situations. For each case, you will be directed to the appropriate section for the information needed to get the recovery started as soon as possible. If you follow the recommended backup procedure (described later) and have all the necessary backup tapes readily available, the recovery job will be much more efficient and less hectic in times of emergency.

#### **File(s) Corrupted or Removed by Accident**

To restore data files that were created by *StarKeeper II* NMS, you need the most recent full, daily, and weekly incremental backup tapes. Proceed to **Restoring Individual Files Using *frecover*** in the **Restoring Your Data** subsection. If the files that need to be restored are not stored on the full or incremental backup tapes, you need the most recent, root disk backup. Proceed to **Restoring Individual Files Using *cpio*** in the **Restoring Your Data** subsection.

#### **Disk or System Failure**

In the case of a disk or system failure, contact your support organization to have the disk or system replaced. To recover system and data files, you need the most recent, root disk backup and the most recent, full and incremental data backups to restore HP-UX, the *StarKeeper II* NMS, and all the data files. Proceed to **Bootting Up and Recovering From the Root Disk Backup Tape** in the **Restoring Your Data** subsection. Upon completion, proceed to **Restoring All Files Using *frecover*** in the **Restoring Your Data** subsection.

If your backups were performed using procedures other than the recommended backup strategy described later in this section, follow the recovery process for that backup procedure.

If you do not have backups of any form, you need to reinstall HP-UX and *StarKeeper* II NMS; proceed to **Installing HP-UX on a New Disk**.

## **Backing Up Your System**

---

This subsection provides a recommended backup strategy followed by descriptions and step-by-step procedures for performing backups. In this subsection, files on your *StarKeeper* II NMS system are categorized into **system files** and **data files**.

**System files** are those files installed to perform various system functions (for example, OS or *StarKeeper* II NMS system). In a normal operation, these files usually remain unchanged until an upgrade or update is performed. A periodic **root disk backup**, fulfills the normal backup requirements for these files.

**Data files** are those files created to support the system operation or to record the various daily activities of a system. HP-UX needs many data files, such as log files, system configuration files, and various tables to support its operation. *StarKeeper* II NMS requires its own set of system configuration files and various tables as well. In addition, *StarKeeper* II NMS creates and modifies various data files in the form of tables, log files, database files, and application configuration files. The contents of data files change frequently. Therefore, they should be backed up frequently. In case of a data loss, they can then be restored from the most recent backup. **Full backups** and **incremental backups** are performed on data files. See the discussion on the difference between full and incremental backups later in this section.

## **Recommended Backup Strategy**

The frequency and strategy of backing up the complete system or the data created and/or changed during the daily operation of a system, varies from site to site. As a recommendation, a minimum backup strategy is presented. For a typical installation, the following backup strategy guarantees that no more than 24 hours of data will be lost in case of a disaster. This strategy requires at least four sets of DDS tapes. To provide better file recovery and tape failure tolerance, multiple tapes can be used for a specific backup level. Backup level and tape redundancy are discussed in the **Backup Levels** subsection.

The first set of tapes are used to perform a backup on every file on the root disk. This includes the HP-UX operating system with its system configuration files, but does not include files on other filesystems. The root disk backup, which should be performed monthly, uses the **make\_recovery** command. We recommend that you shutdown the system to the single user mode to ensure that every file on the system is backed up properly.

The other three sets of tapes are used for a monthly full backup, a weekly incremental backup and a daily incremental backup, respectively. The monthly full backup includes all files specified in a graph file, whereas incremental backups include only those files specified in a graph file that have been created or modified since the last incremental backup. Graph files will be described in more detail in the subsection, **Graph Files**. The full and incremental backups can be performed in multi-user mode, thus allowing the administrator to schedule these backups either while users are on the system or during off hours. The full and incremental backups are accomplished by the **fbackup** utility. The **frecover** utility can be used to extract or record files from the tape backed up by **fbackup**.

This section provides the steps to perform an adequate backup and recovery of a daily operation. For more detailed information on **fbackup** and **frecover**, refer to the HP manuals.

## Backup Levels

Backup levels are a way of specifying varying degrees of incremental backup. To implement the recommended backup strategy, you need to specify the backup level in the **fbackup** command to indicate which type of backup you wish to perform. The following illustration presents the associated backup levels for the full, weekly, and daily incremental backups in the recommended backup strategy described above. In this example, although a monthly root disk and full backup are required, the recommended backup strategy is actually implemented over a four-week cycle. A full (level 0) data backup followed by a root disk backup, are performed on the first Sunday of the first week. A full data backup (level 1) is scheduled on every Friday. Incremental (level 2) backups are performed for the rest of the week when there is no other lower level backup scheduled. This example assumes that Sundays and Fridays are the least busy days for the system. As long as you follow the frequency recommended, you can vary the day of the week for each level of backup.

The monthly backup of the root disk is a separate step that utilizes the **make\_recovery** command and will not need a backup level to accomplish the job. See **Monthly Root Disk Backup Using make\_recovery** for details. In the worst case scenario, where your system became corrupt on Thursday the 12th, you should follow the following sequence to restore your system to its Wednesday the eleventh state:

1. Restore the monthly full backup from Sunday the 1st.
2. Restore the weekly incremental backup from Friday the 6th.
3. Restore the incremental backup from Wednesday the 11th.



In a case that is less severe, you may only need to recover a few files. Depending on when the files were last changed, a daily or weekly incremental may be sufficient in restoring them. The recommended backup strategy requires four sets of DDS tapes to implement. Each set contains two to six tapes, depending on the nature of the backup. Multiple tapes are used to accommodate situations such as mechanical tape failures and backup failures, or requests to restore files to the state of more than 24 hours ago.

```

level 0 - monthly full backup
level 1 - weekly incremental backup on Friday
level 2 - daily incremental backup, except Friday

Week 1:
Date of the month: 1 2 3 4 5 6 7
Day of the week: Su M T W Th Fr Sa

backup level 0 2 2 2 2 1 2

Week 2:
Date of the month: 8 9 10 11 12 13 14
Day of the week: Su M T W Th Fr Sa

backup level 2 2 2 2 2 1 2

Week 3:
Date of the month:15 16 17 18 19 20 21
Day of the week: Su M T W Th Fr Sa

backup level 2 2 2 2 2 1 2

Week 4:
Date of the month:22 23 24 25 26 27 28
Day of the week: Su M T W Th Fr Sa

backup level 2 2 2 2 2 1 2

Week 1:
Date of the month:29 30 31 1 2 3 4
Day of the week: Su M T W Th Fr Sa

backup level 0 2 2 2 2 1 2

```

#### Screen 7-7. Recommended Backup Schedule

As a minimum, two tapes are required to perform the monthly root disk backup. They are used alternately each month to provide better data security. Similarly, a minimum of two tapes are required for the monthly full (level 0) data backup, as well as for the weekly (level 1) incremental backup. For the daily (level 2) incremental backup, six tapes are required - one for each day of the week that is scheduled for a level 2 backup.

## Graph Files

To implement the recommended backup strategy, a graph file is needed in the command line option for **fbackup** and **frecover**. A graph file is a file that contains a list of files or directories you want to include in the backup. It is known as a graph file because it provides a graph (chart) of the directories in your directory structure that you want to back up. In the graph file you can also specify that certain files or sub-directories in the included directories should be excluded in the backup.

For example, in a *StarKeeper* Graphics System, */usr* is a directory that should be included in the full and incremental backups. It should be therefore specified in the graph file as included. Nonetheless, some sub-directories or files under */usr*, such as */usr/bin*, remain mostly unchanged in a normal operation. You do not need to backup these sub-directories or files on a daily or weekly basis and they can therefore be excluded. The guide line is, if the majority of files or sub-directories are to be included, then it is easier to list the parent directory as included and list the unnecessary sub-directories or files as excluded.

Graph files are created by using your favorite text editor and can be stored in any directory you prefer. When used with the **-g** option for **fbackup** and **frecover**, you can provide either the absolute (full) or relative path name of the graph file. If you use the full path name of the graph file, you can issue the command in any directory. If you use the relative path name, when issuing the command you need to make sure the directory you are in correlates to it. Examples of the backup command can be found in the **Using *fbackup* to Back Up Your System** subsection.

Graph files contain one entry per line. If an entry begins with the two characters "i " (i, space), the files or directories represented on that line are *included* in the backup (or restoration). If an entry begins with the two characters "e " (e, space), the files or directories represented on that line are *excluded* from the backup (or restoration).

For *StarKeeper II* NMS, the following example is the graph file for the recommended backup strategy described earlier in this chapter.

```
Include the following for all systems:
i /etc/passwd
i /etc/shadows
i /etc/dkstrvtab
i /etc/dkhosts
i /etc/dkuidtab

Include the following for Core or Co-resident System:
i /usr2/SK

If the Graphics Applications are located in /usr,
include the following as appropriate:
i /usr/AP # Co-resident or Graphics System
i /usr/NM # Co-resident or Graphics System
i /usr/PR # Co-resident or Graphics System
i /usr/NB # Co-resident or Graphics System

If the Graphics Applications are located in /usr2,
include the following as appropriate:
i /usr2/AP # Co-resident or Graphics System
i /usr2/NM # Co-resident or Graphics System
i /usr2/PR # Co-resident or Graphics System
i /usr2/NB # Co-resident or Graphics System

If user login directories are in /users, include the following for
all systems. Otherwise, include the appropriate parent directory
of all user login directories.
You can also exclude the user login directories you consider unnecessary
for the backup after the parent directory is included.
i /users
```

In this example, all the included and excluded files and directories for the Core, Co-resident and Graphics Systems are listed. You need to refer to the comments before and trailing each entry in the example to create a graph file for your system. Entries without trailing comments apply to all three systems.

Note that the comment lines (preceded with the # signs) and the blank lines are used in the example for explanatory purpose. When creating a graph file for your system, comments and blank lines are not allowed. The graph file should therefore contain nothing but the included and excluded entries.

#### **NOTE:**

The line for the */etc/shadows* file (line 3 above) should only be included for systems in which the file exists.

## Full Backups versus Incremental Backups

Once you have identified the list of files to include and exclude, you need to decide whether you want all of the files represented by your list to be backed up (a full backup), or only those files that have changed (or that are new) since the last time you backed up this set of files (an incremental backup). In a normal operating environment, the full backup should take longer to complete than the incremental backup. A full backup does not mean a backup of every file on your system. It means a backup of every file included in the graph file, regardless of when it was last backed up.

A backup of the root disk using **make\_recovery**, described later in the **Monthly Root Disk Backup Using make\_recovery** subsection, will backup the files needed to restore function of your primary boot disk.

## Before Starting fbackup or make\_recovery

Before proceeding with the **fbackup** or **make\_recovery** commands, check and ensure the following:

1. Ensure that files you intend to back up are not being accessed.

### ⇒ NOTE:

The **fbackup** command will not back up files that are active (open) or locked when it encounters them.

2. Verify that the connections to the backup device are correct.
3. Verify that the backup device is turned on.
4. Ensure that the backup device is loaded with media. If the backup requires you to use additional media, the **fbackup** or **make\_recovery** commands will prompt you when to load more media.
5. Ensure that you have superuser capabilities.

## Monthly Root Disk Backup Using make\_recovery

The monthly root disk backup is best performed with the **make\_recovery** command. The **make\_recovery** command provides a user interface to create a bootable tape that contains a copy of the root filesystem.

The monthly root disk backup should be done after the monthly full (level 0) data files backup so that the latest backup history file is included in it. (Refer to the **Monthly Full Data Files Backup** section for more information.)

The following procedure is used to perform the monthly root disk backup.

**Procedure 7-4. Performing a Root Disk Backup**

---

1. If you are running VUE, go to the VUE Login Window, select the Options button, and select the No Windows option.
2. Login as *root*.
3. Shutdown the system to single user mode using the command:  
***shutdown 0***
4. Insert a WRITE enabled 4mm tape into the tape drive.
5. Run the following command:  
***make\_recovery -v -A***  
This should take about 30 to 60 minutes to complete.
6. When the backup is done, bring the system back into multiuser mode using the command:  
***init 4***

**Using fbackup to Back Up Your System**

To implement the aforementioned recommended backup strategy, a graph file must be created (see **Graph Files**). The file that contains the incremental backup history is, by default, */usr/adm/fbackupfiles/dates*. **fbackup** uses this file to decide when and at which level the last backup was done so it can perform the backup requested. It is important that the directory *fbackupfiles* exists under */usr/adm* so that the file *dates* can be created or updated upon the completion of a backup.

**NOTE:**

Using the OS command **mkdir**, create a directory *tapes* if you want **fbackup** to create a *tape* file.

The **fbackup** command line options used to implement the recommended backup strategy are described below. For the full set of available options for **fbackup(1M)**, see the HP manuals.

- f** the tape drive device name. For a system using different devices, substitute with the appropriate device name.
- [0-9]** the backup level.
- v** verbose mode, (optional)
- g** the graph file name. If the graph file is not in the current directory, the full path name must be provided.
- u** update the history file when the backup completes successfully.

### Monthly Full Data Files Backup

A full backup will backup every file specified in the graph file regardless of whether it has been backed up before. This will usually take longer to complete than the incremental backup with the same graph file. To perform the monthly full data files backup, log on as **root** and use the following command:

```
/etc/fbackup -f /dev/rmt/0m -0 -v -g <graph_file_path> -u
```

### Weekly Incremental Data Files Backup

An incremental backup will backup only those files that have been changed since the last backup of same or lower level. This will usually take less time to complete than the full backup with the same graph file. To accomplish the weekly incremental data files backup, log on as **root** and use the following command:

```
/etc/fbackup -f /dev/rmt/0m -1 -v -g <graph_file_path> -u
```

### Daily Incremental Data Files Backup

To perform the daily incremental data files backup, log on as **root** and use the following command:

```
/etc/fbackup -f /dev/rmt/0m -2 -v -g <graph_file_path> -u
```

## Scheduling Automated Backups

You may automate your backup procedure using the **crontab(1)** utility, which interfaces with the HP-UX process scheduling facility, **cron(1M)**. You can find additional information about **cron** and **crontab** in the HP manuals. To automate your backup procedure, you need to:

1. Create a file that defines the process you want to automate.
2. Activate the processes that are defined in the file you created.

### ⇒ NOTE:

If you schedule **fbackup** via the **crontab** utility you should be aware that **fbackup** is a highly interactive utility. If it should need attention (tape change, device not on line, and so forth), **fbackup** will attempt to prompt for the input it needs. This may cause an automated backup to fail (or not complete). You should therefore ensure that the checklist in the **Before Starting *fbackup* or *make\_recovery*** subsection is performed.

## Creating an Automated Backup Schedule File

The **crontab** utility allows you to specify an input file containing the date, time, and runstrings of the backup procedures (processes) that you want to automate (see examples in the **Backing Up Your System** subsection). When scheduling processes with **crontab**, you must redirect any output that is normally sent to the console, to a file so that you can catch any messages that could have scrolled off the console screen.

Here is an example of how to schedule automated backups for the recommended backup strategy described earlier in this chapter. Assume that the backups are to be performed at 4:03 a.m. and the media is DDS format (DAT) tape. The following **crontab** file implements the recommended backup strategy:

```
3 4 * * 1 /usr/adm/incrback >> monbackup
3 4 * * 2 /usr/adm/incrback >> tuebackup
3 4 * * 3 /usr/adm/incrback >> wedbackup
3 4 * * 4 /usr/adm/incrback >> thubackup
3 4 * * 5 /usr/adm/weekback >> fribackupweek
3 4 * * 6 /usr/adm/incrback >> satbackup
3 4 * * 0 /usr/adm/incrback >> sunbackup
```

In the example above *incrback* and *weekback* are shell scripts that contain the **fbackup** commands. It is assumed that the full monthly backup (level 0) is performed manually on the first Sunday of the month. The output of each entry in this file is redirected to a log file for each day of the week. The messages generated by **cron** will be sent as mail to the *root* login. When **fbackup** is running, if there are any error messages displayed on the console, they will be redirected to the files specified.

The **fbackup** commands for the recommended backup strategy can be found in the **Backing Up Your System** subsection. You need to use a text editor to create the **crontab** file and the script files. In this example the script files are stored in */usr/adm* and the log files will be created in the home directory of the login used to activate the **cron** job. They can be changed as appropriate.

## Activating Your Automated Backup Schedule

Once you have created the file defining your time-scheduled backups, you must inform **cron** that it has new jobs to schedule. This is done via the **crontab** utility. For example:

***crontab your\_crontab\_file***

This will activate all of the processes defined in **your\_crontab\_file**. This cancels any previously scheduled processes not defined in **your\_crontab\_file**.

 **NOTE:**

Before activating a new **crontab** file, you should view currently scheduled processes. Consider adding these processes to your **\_crontab\_file**. See **Displaying Your Automated Backup Schedule**.

After your cronfile backup has been activated, you must always ensure that:

- The system clock is set properly.
- The backup device is properly connected and the HP-UX I/O system recognizes the device file specified in the **fbbackup** runstring.
- Adequate media has been loaded in the backup device.
- The backup device is connected your system and turned on.

### **Displaying Your Automated Backup Schedule**

To list your currently scheduled processes, execute the command:

***crontab -l***

This will display the contents of your activated **crontab** file. You should always view the currently scheduled processes before activating a new **crontab** file to be sure that you do not cancel processes that need to remain active. If there are such processes, add them to the definitions in your new **crontab** file before executing the **crontab** command to add new processes.

### **Deactivating Your Automated Backup Schedule**

To deactivate all of your currently scheduled processes, execute the command:

***crontab -r***

### **Changing Your Automated Backup Schedule**

To change your currently scheduled processes:

1. Edit your **crontab** file, which defines the jobs to time schedule to incorporate the changes you want.
2. Activate the edited file as you did the original. See **Activating Your Automated Backup Schedule**.



## **Restoring Your Data**

---

The primary reason for making backup copies of your data is so you can restore needed files that have been removed (or damaged).

There are two types of situations you are likely to encounter:

1. One or a few files need to be recovered, usually as a result of an accidental deletion or because the file has been overwritten by the wrong data.
2. You need to recover all of the files. This is usually part of the system crash recovery process.

Individual files can be restored from either the root disk backup or the incremental backups, depending on their file types and when the last backup was done.

If this recovery is part of the system failure or disk crash recovery process, you need to use the root disk backup tape to boot up the system, as described in **Booting Up and Recovering From the Root Disk Backup Tape**.

### **Before Starting `frecover` or `cpio`**

Before proceeding with **`frecover`** or **`cpio`**, check the following:

1. Ensure that files you intend to restore are not being accessed.  
The **`frecover`** command will not restore files that are active (open) or locked when it encounters them.
2. Verify that the connections to the device are correct.
3. Verify that the device is turned on.
4. Ensure that the device is loaded with media. If the restore process requires you to use additional media, the **`frecover`** command needs to be executed separately for each media.
5. Ensure that you have superuser capabilities.
6. Ensure that there is enough space on the disk to recover the files. This may require you to do some clean up work. The **`cpio`** and **`frecover`** utilities will only recover files specified and will not attempt to clean up the disk or directory.
7. When restoring data files for *StarKeeper II* NMS, it may be necessary to restore more files than those that were corrupted. This is because some data files have index files or other files associated with them and should be restored together in order for the system to work properly.

## Booting Up and Recovering From the Root Disk Backup Tape

If your system cannot boot up from the disk and you have a root disk backup made by using **make\_recovery**, use the following steps to perform a full system recovery.

1. The system you are using should be halted and powered off at the beginning of this process.
2. If the system was not ordered with an internal DDS format tape drive, connect the DDS tape drive to the system and power up the DDS tape unit.
3. When powering up the SPU, do NOT let the computer select a default system and attempt to start up HP-UX. Looking ahead to what you will see when you start up your SPU, the BOOT menu will look something like one of the following two screens, depending on what system you are running.

For a C200:

CPU 0

**WARNING:** Memory has been initialized, but not tested as a result of FASTBOOT being enabled. To test memory, disable FASTBOOT and reboot system

Processor is booting from first available device.

To discontinue, press any key within 10 seconds.

Boot terminated.

-----Main Menu -----

| Command                         | Description                      |
|---------------------------------|----------------------------------|
| -----                           | -----                            |
| BOot [PRI ALT <path>]           | Boot from specified path         |
| PAth [PRI ALT CON KEY] [<path>] | Display or modify a path         |
| SEArch [DIsplay IPL] [<path>]   | Search for boot devices          |
| COnfiguration menu              | Displays or sets boot values     |
| INformation menu                | Displays hardware information    |
| SERvice menu                    | Displays service commands        |
| DIsplay                         | Redisplay the current menu       |
| HElp [<menu> <command>]         | Display help for menu or command |
| RESET                           | Restart the system               |

Main Menu: Enter command or menu >

For a 715/64 or a 715/100:

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All rights reserved.

PDC ROM rev. 1.2  
IODC ROM rev. 1.0  
32 MB of memory configured and tested.

Selecting a system to boot.  
To stop selection process, press and hold the ESCAPE key.

Selection process stopped.

Searching for Potential Boot Devices.  
To terminate search, press and hold the ESCAPE key.

Search terminated.

| Command                                | Description                                                                                                                                                              |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -----                                  | -----                                                                                                                                                                    |
| Auto [boot search] [on off]            | Set/show auto mode                                                                                                                                                       |
| Boot [pri alt [isl]                    | Boot from primary or alternate path                                                                                                                                      |
| Boot [scsi eisa.<slot>[.<addr>]] [isl] | Boot from SCSI or EISA                                                                                                                                                   |
| Boot lan[.<addr>] [install] [isl]      | Boot from LAN                                                                                                                                                            |
| Chassis [on off]                       | Set/show chassis codes display mode                                                                                                                                      |
| DefaultSS                              | Reboot and set EEPROM to default values                                                                                                                                  |
| Diagnostic [on off]                    | Set/show diagnostic boot mode                                                                                                                                            |
| Fastboot [on off]                      | Set/show fast boot mode                                                                                                                                                  |
| Help                                   | Show this command menu                                                                                                                                                   |
| Information                            | Show system information                                                                                                                                                  |
| LanAddress                             | Show LAN station address                                                                                                                                                 |
| Monitor [<DEV>[.<type>]]               | Set/show graphics monitor type<br>(<DEV>=graphics graphics_<1 2>)                                                                                                        |
| Path [pri alt [<DEV>[.<addr>]]]        | Set/show boot source path<br>(<DEV>=lan scsi eisa.<slot>)                                                                                                                |
| Path [console [<DEV>[.<parm>]]]        | Set/show boot consloe path<br>(<DEV>=<RS232> <GRAPH><br><RS232>=rs232 rs232_2<br><parm>=<baud>.<length>.<parity><br><GRAPH>=graphics graphics_<1 2><br><parm>=<monitor>) |
| Path [keyboard [hil ps2]]              | Set/show boot keyboard path                                                                                                                                              |
| Pim [hpmc toc lpmc]                    | Show PIM info                                                                                                                                                            |
| Search [ipl] [scsi eisa]               | Show potential boot devices                                                                                                                                              |
| Search [ipl] [lan [install]]           | Show potential boot LAN devices                                                                                                                                          |
| Secure [on off]                        | Set/show security mode                                                                                                                                                   |
| -----                                  | -----                                                                                                                                                                    |
| BOOT_ADMIN>                            |                                                                                                                                                                          |

For 715/75 or 715/33 system:

```

ROM: 9000/715/75
PDC ROM rev. 1.1
IODC ROM rev. 1.0
64 MB of memory have been configured.
Selecting a system to boot.
To stop selection process, press and hold the ESCAPE key.
Selection process stopped.
Searching for Potential Boot Devices.
To terminate search, press and hold the ESCAPE key.
Device Selection Device Path Device Type

.
.
.
b) Boot from specified device
s) Search for bootable devices
a) Enter Boot Administration mode
x) Exit and continue boot sequence
?) Help
Select from menu:

```

On some machines, the message in the screen below will be displayed on the lower left portion of the screen, while on other machines, the message will be **momentarily** displayed in a small window in the center of the screen.

Using the above information as an example, turn ON the SPU.

When you receive a message to interrupt the boot process, press the ESC key. If you miss the interrupt process, power cycle the SPU and try again.

4. Insert the root disk backup tape (created with **make\_recovery**) into the DDS tape drive.
5. When the process stops, you are ready to begin the boot process from the root disk backup tape. At this point, you have not yet loaded any software, and the boot ROM is still controlling the startup process.
6. At which ever screen your system displays, enter the command:

***boot scsi.3.0***

If you receive a message *Interact with IPL (Y or N)?>* enter *n*.

7. The system should boot from the tape and automatically restore the root disk. When the restore is completed, the system will reboot and boot from the root disk.

### Restoring Individual Files Using **frecover**

In this first example, we will restore the files belonging to the directory */usr2/SK* from DDS tape. If files are currently in that directory (on the disk) that are newer than the corresponding files on the tape, we will not overwrite the newer version on disk. If you want to overwrite it with the older version on the tape, use the **-o** option in the command line. If you want to recover the newer version to a different directory instead, proceed to the next example, **Recovering Selected Files to a New Location**. Because you are restoring the files from the device represented by device file */dev/rmt/0m*, you do not need to use the **-f** option. */dev/rmt/0m* is the default device file, used by **frecover** if no other name is specified.

```
/etc/frecover -x -i /usr2/SK
```

### Recovering Selected Files to a New Location Using **frecover**

In this example, you will restore the files from all of the “SK” directories (under */usr2*) from a DDS Format tape, into the */tmp* directory on the system. To do this, you will use the **-F** option to **frecover**, which removes leading path names from all files on the tape. Without the **-F** option, a directory structure of “SK” will be created in the current directory on the disk to mimic what is on the tape. If there are files in the directory */tmp* whose names match those coming from tape (that are newer than the version on tape), you will overwrite the version on disk by specifying the **-o** option. First change our working directory to */tmp*.

```
cd /tmp
```

```
/etc/frecover -x -o -F -i /usr2/SK
```

### Restoring All Files Using **frecover**

If this recovery is part of the system failure or disk crash recovery process, you need to restore the latest full, weekly and daily incremental backups, in the order described.

To restore a complete backup from the DDS tape, use the following command.

```
/etc/frecover -r -o
```

### Installing HP-UX 10.20 On a New Disk

This section explains how to install the HP-UX 10.20 release on a HP 715 or HP C200 Workstation. You should only have to perform this process if your root disk needs to be replaced and you do not have a root disk recovery tape created with the **make\_recovery** command. If you have a root disk recovery tape, you do not have to perform this operation and should restore the system from your recovery tape.

Performing an HP-UX installation consists of completing a series of steps that transfer files from an installation tape to an HP-UX file system on the system disk. You end up with an operable HP-UX system and can log on as the superuser.

## Overview of an HP-UX Installation

An HP-UX installation occurs as follows:

- You work through a series of steps. The steps focus on the series of screens presented by the installation program. The screens contain menus or forms. Your task is to interpret the menus (forms), specifying how you want to perform the installation while moving from screen to screen.
- You are asked to specify values for options. The menus often provide default values. This document will provide recommended values for the options. It is good practice to use the defaults and accept the recommendations unless you know why you should pursue alternatives.
- A typical HP-UX installation takes from 2 to 3 hours. For most of this time, the system loads filesets. Occasionally, you are prompted to load a tape or answer a prompt, but most of the time you let the system do the work.
- After an HP-UX installation, you can restore all your system files, *StarKeeper II* NMS software and applications, and user data from backup tape, provided you have performed incremental system backups.

If you do not have any backup tape, you can use the *StarKeeper II* NMS Install tape to re-load and re-configure your *StarKeeper II* NMS system. See the *StarKeeper II NMS Getting Started Guide* and follow instructions for a software package installation.

The HP-UX installation process takes the following actions:

- Destroys files that exist on the root disk.
- Constructs a filesystem on the root disk.
- Copies files from installation tape to the *root* filesystem (for example, */usr*, */etc*, and */dev*).
- Builds a kernel on the root disk (*/stand/vmunix*).
- Creates a login for the superuser and places the system in a state that lets you log in.

An HP-UX installation ends when these actions have been taken.

## Obtain and Organize Everything You Need

Have the HP-UX 10.20 ACE Install tape and the HP composite software tape available.

Have the following information ready because at the end of the installation process, you are prompted for:

- A time zone
- A time and date
- A host name
- Internet protocol address (optional).

### Installing HP-UX 10.20

Refer to the HP 9000 Computers *Installing HP-UX 10.20 and Updating from HP-UX 10.0X to 10.20* (Order Number B2355-0911) documentation to install HP-UX 10.20 on your system. Use the section **Installing HP-UX 10.20**.

Once the HP-UX 10.20 installation has started, use the following table to complete the process. Use the default values for any other installation system parameters.

**Table 7-5. HP-UX 10.20 Install Parameter Values**

| HP-UX 10.20<br>Installation Screen | 715<br>Workstation<br>Parameters | C200 Workstation Parameters                                                                                                                                                                                                                                                                                                                 |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
|------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|--------|------|-----|--------|------|-----|--------|------|------|--------|-------|-----|--------|-------|------|-----|
| System Configuration               | Standard Whole Disk              | Standard LVM                                                                                                                                                                                                                                                                                                                                |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| Primary Swap Size                  | 200 MB                           | 400 MB                                                                                                                                                                                                                                                                                                                                      |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| Software Selection                 | VUE Runtime Environment          | VUE Runtime Environment                                                                                                                                                                                                                                                                                                                     |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| Load ACE                           | False                            | True                                                                                                                                                                                                                                                                                                                                        |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| Modify FS Parameters               | N/A                              | <table> <tr> <th>Filesystem*</th><th>Size</th><th>Option</th></tr> <tr> <td>/usr</td><td>800</td><td>Modify</td></tr> <tr> <td>/var</td><td>300</td><td>Modify</td></tr> <tr> <td>/opt</td><td>1300</td><td>Modify</td></tr> <tr> <td>/home</td><td>100</td><td>Modify</td></tr> <tr> <td>/swdl</td><td>1000</td><td>Add</td></tr> </table> | Filesystem* | Size | Option | /usr | 800 | Modify | /var | 300 | Modify | /opt | 1300 | Modify | /home | 100 | Modify | /swdl | 1000 | Add |
| Filesystem*                        | Size                             | Option                                                                                                                                                                                                                                                                                                                                      |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| /usr                               | 800                              | Modify                                                                                                                                                                                                                                                                                                                                      |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| /var                               | 300                              | Modify                                                                                                                                                                                                                                                                                                                                      |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| /opt                               | 1300                             | Modify                                                                                                                                                                                                                                                                                                                                      |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| /home                              | 100                              | Modify                                                                                                                                                                                                                                                                                                                                      |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |
| /swdl                              | 1000                             | Add                                                                                                                                                                                                                                                                                                                                         |             |      |        |      |     |        |      |     |        |      |      |        |       |     |        |       |      |     |

\* Do not add the filesystem **/swdl** for a Graphics C200 workstation.

When the HP-UX 10.20 prompts you for the HP-UX Core Operating System tape, use the HP Composite Software Tape for *StarKeeper II NMS R10.0* to complete the installation.

## Second Disk Configurations

After the HP-UX 10.20 installation is completed and you have entered the system information, you will need to configure the second disk on your system. Since the 715 Workstations use whole disk configuration and the C200 Workstations use the LVM configuration, the process to configure the second disk is different. Use the **Configuring the Standard Whole Disk** procedure for a 715 Workstation and **Configuring the Standard LVM Disk** procedure for a C200 Workstation.

---

### Procedure 7-5. Configuring a Standard Whole Disk

---

Use this procedure for a 715 Workstation.

1. From the **Console Login** prompt, log in as **root**. If your system is running in HP VUE mode, get to the **Console Login** prompt by selecting **No Windows** from the **Options** menu.
2. Create the **/usr2** directory by entering **mkdir /usr2**.
3. If the workstation is a Core or Co-resident system, create the **/swdl** directory by entering **mkdir /swdl**.
4. If the second disk was striped, create device files for the second disk. Enter the following commands to create the device files for the striped disk.

```
mknod /dev/dsk/c0t5d0s1 b 31 0x005001
```

```
mknod /dev/dsk/c0t5d0s2 b 31 0x005002
```

```
mknod /dev/dsk/c0t5d0s3 b 31 0x005003
```

```
mknod /dev/rdisk/c0t5d0s1 c 188 0x005001
```

```
mknod /dev/rdisk/c0t5d0s2 c 188 0x005002
```

```
mknod /dev/rdisk/c0t5d0s3 c 188 0x005003
```

5. Add the following lines to the **/etc/fstab** file, depending on what disk format was configured. The second entry for **swap** on the whole disk entry should only be entered if the second disk was initially configured with **swap**. If you are not sure, leave the **swap** entry out of the **/etc/fstab** file; it can always be added at another time.

Whole Disk:

```
/dev/dsk/c0t5d0 /usr2 hfs defaults 0 2
```

```
/dev/dsk/c0t5d0 swap defaults 0 0
```



Striped Disk:

```
/dev/dsk/c0t5d1 swap defaults 0 0
```

```
/dev/dsk/c0t5d2 /swdl hfs defaults 0 2
```

```
/dev/dsk/c0t5d3 /usr2 hfs defaults 0 3
```

Because system files needed to start up *StarKeeper* II NMS were lost during the HP-UX 10.20 installation, you must install *StarKeeper* II NMS to install startup scripts and additional HP products.

6. To verify that all disks are mounted, enter **mount -a**.
7. Change to the **/tmp** directory by entering **cd /tmp**.
8. Insert the *StarKeeper* II NMS R10.0 Install Tape into the tape drive and wait for the lights to stop blinking.
9. Install the *StarKeeper* II NMS installation scripts by entering **tar xvf /dev/rmt/0m**.
10. Create a system recovery file so the installation will recognize that this is a recovery by entering the following:  
**echo >/opt/SK/upgrade/logs/SYSTEM\_RECOVERY.**
11. Change to the **/opt/SK/upgrade/bin** directory by entering the following:  
**cd /opt/SK/upgrade/bin.**
12. Type the command **./hpupgrade** to start the recovery process. It will install HP system files and then start the *StarKeeper* II NMS installation. Follow the prompts to complete the installation.
13. The following commands should be executed after *StarKeeper* II NMS Install has been completed on a 715 system that is a Core or Co-resident configuration.

```
chown ndswadm:sk /swdl
```

```
chmod 775 /swdl
```

**Procedure 7-6. Configuring a Standard LVM Disk**

---

Use this procedure for a C200 Workstation.

1. From the **Console Login** prompt, login as **root**. If your system is running in HP VUE mode, get to the **Console Login** prompt by selecting **No Windows** from the **Options** menu.
2. Enter the following commands to create the logical volume for the second disk.

```
pvccreate -f /dev/rdisk/c0t5d0
```

```
mkdir /dev/vg01
```

```
mknod /dev/vg01/group c 64 0x010000
```

```
vgcreate /dev/vg01 /dev/dsk/c0t5d0
```

```
lvcreate -L 2000 /dev/vg01
```

Once the device files for the logical volume are created, configure the system to mount the required disks.

3. Make a directory for usr2 by entering **mkdir /usr2**.
4. Add the following line to the **/etc/fstab** file.

```
/dev/vg01/lvol1 /usr2 hfs defaults 0 2
```

**StarKeeper II NMS Core or Co-resident System Restoration**

You will only need to perform the following procedure if the system you are restoring is a *StarKeeper II* NMS Core or Co-Resident system.

**Procedure 7-7. Restoring a StarKeeper II NMS Core or Co-resident System**

---

1. Enter the following commands to set up the *StarKeeper II* NMS database backup area.

```
lvcreate -L 2000 /dev/vg01
```

```
mkdir /SK_DBBK
```

2. Add the following line to the **/etc/fstab** file.

```
/dev/vg01/lvol2 /SK_DBBK hfs defaults 0 2
```

Because system files needed to start up *StarKeeper II* NMS were lost during the HP-UX 10.20 installation, install *StarKeeper II* NMS so it installs startup scripts and additional HP products.

3. To verify that all disks are mounted, enter **mount -a**.
4. Change to the **/tmp** directory by entering **cd /tmp**.
5. Insert the *StarKeeper* II NMS R10.0 Install Tape into the tape drive and wait for the lights to stop blinking.
6. Install the *StarKeeper* II NMS installation scripts by entering **tar xvf /dev/rmt/0m**.
7. Create a system recovery file so the installation will recognize that this is a recovery by entering the following:  
**echo >/opt/SK/upgrade/logs SYSTEM\_RECOVERY.**
8. Change to the **/opt/SK/upgrade/bin** directory by entering **cd /opt/SK/upgrade/bin**.
9. Type the command **./hpupgrade** to start the recovery process. It will install HP system files and then start the *StarKeeper* II NMS installation. Follow the prompts to complete the installation.
10. Execute the following commands after *StarKeeper* II NMS Install is completed on a C200 system that is a Core or Co-resident configuration.

**chown cnmsadm:sk /SK\_DBBK**

**chmod 775 /SK\_DBBK**

**chown ndswadm:sk /swdl**

**chmod 775 /swdl**

## Corrective Maintenance

---

Corrective Maintenance is the process of correcting a problem after it happens. The following subsections deal with types of problems that may occur.

### Installation Problems

---

This section deals with maintaining a functioning system. The discussion assumes problems, whether potential or experienced.

- a. The correct versions of hardware and software were installed. To confirm, use the *StarKeeper II* NMS **Display** command. This command displays hardware and software versions, and software licensing. Run **help** for a complete description of the **Display** command.
- b. All cable connections are secure and properly made.
- c. *StarKeeper II* NMS must be installed in the */usr2* path and INFORMIX in the */opt* path.
- d. There is sufficient space (memory) for all software.
- e. OS tunable parameters are configured properly.

### Connection Problems

---

Possible connection problems can be found using the *StarKeeper II* NMS **connections** command, which displays the status of all connections between *StarKeeper II* NMS and the nodes defined in its configuration database. This command also displays the connection status between master and subordinate *StarKeepers*, and between *StarKeepers* and other NMSs.

Enter **connections** (or **conn**) to review the status of each connection. To concentrate on just one connection, use the **connections** command in conjunction with the OS **grep** command by “piping” them together, as follows: **connections | grep <nodename>**. As another example, you can display just those connections that are down by entering **connections | grep Disconn**. Each connection is in one of these states:

|                  |                                                                                                                                                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Connected</i> | The connection is established using connection information supplied by the <b>cfenter</b> command. (See <b>Chapter 4</b> .) This is the normal state for an active connection.                                                 |
| <i>Inactive</i>  | The connection has been deactivated (using the <b>cfchange</b> command). To reactivate the connection, use the <b>cfchange</b> command. (See <b>Chapter 4</b> ).                                                               |
| <i>Disconn</i>   | The connection has been activated (using the <b>cfenter</b> or <b>cfchange</b> command), but <i>StarKeeper II</i> NMS cannot establish the connection. Check the cabling and refer to the <i>tracefiles</i> (explained below). |

**Pending** The system monitor is trying to establish the connection, but has not done so yet. Wait a minute and reenter the **connections** command.

**Console** A connection has been established to either the B port or the M port via the **console** command.

A portion of a sample response to the connections command is shown in the following screen.

| SYSTEM/NODE NAME  | StarKeeper<br>NMS NAME | CONNECTION<br>CLASS | STATUS    | PORT     |
|-------------------|------------------------|---------------------|-----------|----------|
| star1             |                        | SK-SKIINMS          | Connected | mx       |
| east/forest/node1 | star1                  | DKII-ADMIN          | Pending   |          |
| east/forest/node1 | star1                  | DKII-PERFORM        | Inactive  |          |
| east/forest/node1 | star1                  | DKII-BILLING        | Disconn   |          |
| east/forest/node1 | star1                  | DKII-MAINT          | Console   |          |
| 957/platinum      | star1                  | DKII-CONSOLE        | Connected | dk/dk013 |

#### Screen 7-8. Sample Response to connections Command

If the **connections** command cannot find the INFORMIX database, an error message is displayed. If you get the error message, ensure that the \$DBPATH variable is properly set (to the directory containing the *StarKeeper II* NMS database as specified in the “cnms” environment script called by the *cnmsadm.profile*). Also ensure that the file *sk.dbs* is in the \$DBPATH directory (use the OS **cd** and **ls** commands). (The error message includes an INFORMIX error number, which is listed in the INFORMIX-SQL documentation.)

*StarKeeper II* NMS has a special debugging tool called the *tracefile* (.S file) to assist in locating connection problems, as reported by a *Disconn* status with the **connections** command. All connections can be traced by viewing the tracefile. There is a tracefile for each connection to a node. Go to the *\$MSGLOG/<node name>* directory and use the OS **ls** command to get a directory list of files. Use the OS **cat** command to view the “.S” files to trace the connection. A complete list of possible connection classes and their trace files is shown in the table below.

**Table 7-6. Connection Classes and Tracefiles**

| Connection Class | Trace File     | Connection Class | Trace File     |
|------------------|----------------|------------------|----------------|
| DKII-CONSOLE     | DKII-CONSOLE.S | SK-NMS           | SK-NMS.S       |
| DKII-DIAL        | DKII-DIAL.S    | SK-NMS4          | SK-NMS4.S      |
| DKII-BILLING     | DKII-BILLING.S | SL-NMS           | SL-NMS.S       |
| DKII-MAINT       | DKII-MAINT.S   | COM6800-NMS      | COM6800-NMS.S  |
| DKII-ADMIN       | DKII-ADMIN.S   | PARADYNE-NMS     | PARADYNE-NMS.S |
| DKII-PERFORM     | DKII-PERFORM.S | SK-SKIINMS       | SK-SKIINMS.S   |

These tracefiles provide an indication of where the connection went wrong. For example, it is possible that you entered a bad dialstring during configuration. If a bad dialstring was entered, `INVALID DESTINATION` is returned by the network node in the tracefile.

**⇒ NOTE:**

If a node connection status is *Disconn*, the problem should be fixed or the connection must be made *inactive* in the configuration database.

*StarKeeper II* NMS periodically tries to reconnect all connections with the *Disconn* status. It is a waste of processing time if *StarKeeper II* NMS is trying to connect to a node that is either physically disconnected or if there is a connection problem with the node.

### ***StarKeeper II* NMS to *StarKeeper II* NMS Connections**

If a *StarKeeper II* NMS to *StarKeeper II* NMS connection goes down, run **help** for complete coverage of the link down alarm (LD\_SCP).

### **Host Interface Connections**

If *StarKeeper II* NMS has problems trying to connect to a node using the host interface, you can try connecting to the node through the host directly without going through *StarKeeper II* NMS. This is one of the best ways of debugging a host connection. To do this, follow the steps of the procedure below. (The procedure requires knowledge of node commands.)

---

#### **Procedure 7-8. How to Debug a Host Interface Connection Problem**

---

1. Set your PATH to include `/opt/dk/bin` by entering the following:  
**`PATH=/opt/dk/bin:$PATH`**  
**`export PATH`**
2. To dial out, use the dkhost **dkcu** command by entering the following:  
**`dkcu <dial_string_of_node>`**  
  
For example, the console dialstring is usually  
area/exchange/PortB\_service\_name and the billing dialstring is usually  
area/exchange/billing.m.
3. If you are getting errors with the **dkcu** command, it usually means that either there is something wrong with the way the service address is entered in the node or there is something wrong with the dkhost interface.

If you are getting "Call Failed" errors, try resetting the host interface board by entering `/opt/dk/bin/dkmaint -i 0 -r`. If the problem persists, check the Computer Port Module (CPM) board on the node, using the **display connections** command, and see if it is in an **ACTIVE** state. If the CPM is dead or in an **INACTIVE** state, remove and restore the CPM. Go back to your host computer and try dialing out again. Refer to the dkhost documentation for help on board resetting and **dkcu**.

4. If you can dial out successfully to the node using the **dkcu** command, then *StarKeeper II* NMS should also be able to establish a connection. At this point, if **dkcu** is successful but *StarKeeper II* NMS is not, verify that whatever you have entered for the dialstring into the configuration database is correct. See **Chapter 4**, **cfverify** command.

## **Recovering from a System Crash**

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The procedures for recovering from a system crash are detailed earlier, in this chapter, in the section titled **Backup and Recovery of Your StarKeeper II NMS System**.

## **Troubleshooting**

---

Before you begin troubleshooting, use the *StarKeeper II* NMS **Display** command to check the versions of hardware and software installed, and the software licensing. Run **help** for a complete description of the **Display** command.

Do the troubleshooting checks described in this section if the system is not behaving normally.

## **Checking the Active Processes**

---

Use the standard OS command **ps -ef | grep CNMS** to check active processes. Verify that the following CNMS processes are running:

|              |          |              |          |           |          |
|--------------|----------|--------------|----------|-----------|----------|
| sqlexec (6)* | bcollect | elogger      | parse    | distr     | scpmon   |
| door         | alarmd   | al_action    | pcollect | pid       | dbserver |
| pie          | prep_srv | topspooler** | sc       | dkpoller  | fdg      |
| dbexec**     | ipc_mon  | dmon         | ncsbd    | ff_dbload |          |

\* At least six sqlexec processes will be running.

\*\* At least one (but maybe more) dbexec and topspooler processes will be running.

Also, enter **ps -ef | grep cnms\_mon** and ensure that the root monitor process is running. If this check shows there are missing processes, shut down and restart *StarKeeper II* NMS (**Chapter 3**).

To check for the active processes called *dkserver*, *listener*, and *sqlexec* and to initiate them if they are not active, follow these steps: First, **su** to be the root. To verify that *dkserver* is active, enter **ps -ef | grep dkserver**. If it is not active, as root, run the command **/sbin/rc2.d/S840dkit start**.

To verify that the listener is active, enter **ps -ef | grep listen**. If it is not active, as root, run the command **/opt/dk/bin/dkitrc dkstart -i 0**.

To verify the Informix daemon is active, enter **ps -ef | grep sqlexecd**. If it is not active, as root, run the command **/sbin/rc2.d/S841sql start**.

## **Database Corruption**

---

Database corruption is rare and can have many causes, so there are no easy solutions to fit all cases. One cause is that a file under *\$CNMS\_DBS* was removed manually. There are some simple things you can do to check for database corruption. One way is to look at the *\$DATAFILES/alm\_clean.night* file and the *\$EVENTLOG* for reported errors concerning inserting or deleting from the database. If these type of errors are reported, refer to the next subsection, **Checking Directory and File Structure**.

## **Checking Directory and File Structure**

Make certain the directory and record (file) structure of the database remain intact. All files and directories must exist for the *StarKeeper II* NMS to function properly. Also, the group id and ownership of all files and directories cannot be altered.

To ensure the directory and file structure is intact, follow these steps. The steps require familiarity with INFORMIX **isql** commands.

1. Run the following query in **isql**.

***select tabname, dirpath from systables***

This will list all the table names and corresponding filenames in the database.

2. Compare the file names to those in the *\$CNMS\_DBS* directories, see Steps a through d.
  - a. Use the OS **cd** command to get to the *\$CNMS\_DBS* directory.
  - b. Use the OS **ls -l** command and ensure the following subdirectories exist: *ahp*, *bill*, *cfg*, *per*, and *per2*.
  - c. Use the OS **cd** command to get into each subdirectory, and use the OS **ls -l** command to get a listing of each file in the subdirectory.
  - d. The owner of each file should be *CNMS* and the group id should be *INFORMIX*—use the OS **ls -l** command to check this.



- e. Compare the lists obtained using **ls -l** with the list obtained in Step 1 using **isql**.

Each file (table) is listed twice, once with a *.dat* (dot "dat") suffix and once with a *.idx* (dot "idx") suffix. This identifies the INFORMIX data and index tables.

If files are missing, you will have to run INITDB for the subsystem with the missing files; refer to the procedure that follows.

To check for corrupted indexes, run the INFORMIX utility **bcheck**.

## Reinitializing the Database

If you do not care about the old data in a particular *StarKeeper II* NMS database directory, you can reinitialize the directory tables using the INITDB selection of the DBUTILS Menu. This deletes the collected data, greatly reducing the space that the database takes up, allowing the system to operate more efficiently. For example, if you decide that all alarms data are no longer needed, you can run INITDB to drop the alarm tables and reinitialize them (starting with empty records). See the following procedure.

### Procedure 7-9. How to Delete and Reinitialize a Database Table

Before proceeding, remember that INITDB completely removes the existing selected database and initializes the tables to gather new data. You may want to back up your database first, or you may want to just clean the existing database records rather than deleting them. Instructions for backup and cleanup are elsewhere in this chapter.

1. Shut down *StarKeeper II* NMS: enter SKsh at the SK: prompt, choose SYSADM at the Main Menu, choose DBUTILS from the Sysadm Menu, and then choose SHUTSK from the DBUTILS Menu.

| StarKeeper II (R) Network Management System - Selection Menu |                                                             |               |          |
|--------------------------------------------------------------|-------------------------------------------------------------|---------------|----------|
| Select                                                       | Description                                                 | Menu: dbutils | Level: 3 |
| INITDB                                                       | Initialize the <i>StarKeeper II</i> NMS Database and Tables |               |          |
| RSPACE                                                       | Regain Space From Database Tables                           |               |          |
| STARTSK                                                      | Startup <i>StarKeeper II</i> NMS                            |               |          |
| SHUTSK                                                       | Shutdown <i>StarKeeper II</i> NMS                           |               |          |

Enter a selection (or ?selection for help) and press RETURN

Screen 7-9. DBUTILS Menu

2. Choose INITDB from the DBUTILS Menu.
3. If *StarKeeper II* NMS is not running, you see a screen with current database status, such as shown in the screen below.

| Database                                                                | Status |
|-------------------------------------------------------------------------|--------|
| Configuration Tables                                                    | S      |
| Alarm Tables                                                            | S      |
| Billing Tables                                                          | S      |
| Performance Tables                                                      | S      |
| S: successful      F: failed                                            |        |
| Do you want to re-initialize database or database subsystem(s)? [y, n]: |        |

**Screen 7-10. Database Status Display (INITDB)**

4. If you choose **y**, the screen displays the following:

|                                               |
|-----------------------------------------------|
| INITIALIZE TABLES MENU                        |
| 1) Configuration Tables                       |
| 2) Alarm Tables                               |
| 3) Billing Tables                             |
| 4) Performance Tables                         |
| 5) All Above                                  |
| 6) Quit                                       |
| Please enter selection(s); e.g., 1 or 1,2,3 : |

5. Enter the number(s) that correspond to your choice of tables to reinitialize.
6. Restart *StarKeeper II* NMS by selecting STARTSK at the DBUTILS Menu.

## Examining Message Queues

*StarKeeper II* NMS processes communicate with each other through inter-process communication messages. A process communicates with another process by sending a message to the other process' message queue. Therefore, each *StarKeeper II* NMS process has its own message queue. As soon as *StarKeeper II* NMS is in full operation, a full set of active message queues become resident on the system. These message queues are removed only when *StarKeeper II* NMS is shut down. Some message queues are created and destroyed when a process such as **netdisp** or **alarms** is started and stopped.

## Automatic Monitoring of Message Queues

The ipc monitor is started by the *StarKeeper II* NMS monitor when the system is started. It runs continuously until the system is shut down.

The ipc monitor searches for filled message queues that are not being 'read' (processed) by any of the *StarKeeper II* NMS processes. Every process has input message queues associated with it. If the ipc monitor finds that a process is not reading its message queues, it stops that process from running. If the ipc monitor detects a user-invoked process that is not running at all, it flushes and deletes that message queue.

When a queue is deleted, the messages on that queue (along with the process name) are saved on a disk file. This file can be used to find seemingly lost messages and to see the last message the process read. These files are in the *\$MSGLOG/CNMS* directory, and are named in this format:

**Q.yymmdd.SEQ**

where **yymmdd** is the current date and **SEQ** is the sequence number of the file.

A new file is created each time a queue is flushed. These files are cleaned up by the disk monitor and disk cleaner in the same way as Message Log files (see the section titled **Conserving Disk Space**).

When the ipc monitor kills the alarms process, it writes the following message to all users:

Alarms process <PID> is being terminated by the ipc monitor;  
if you were running the alarms process assure that it is still  
running.

## Manual Monitoring of Message Queues

It is highly important that the message queues of your *StarKeeper II* NMS are being cleared all the time. It is the responsibility of each *StarKeeper II* NMS process to read its own message queue. However, if you suspect the performance of *StarKeeper II* NMS is slowing down for some reason, take a quick look at these queues hourly. Use the OS **ipcs** command (inter-process communication facilities status) to examine the *StarKeeper II* NMS message queues by entering: **ipcs -qo**. The **q** option causes information to be printed about active message queues and the **o** option causes information to be printed on outstanding usage. Refer to the *OS User Reference Manual* if more information is required for this command.

A sample display of the **ipcs -qo** command is as follows:

| T               | ID  | KEY        | MODE        | OWNER | GROUP | CBYTES | QNUM         |
|-----------------|-----|------------|-------------|-------|-------|--------|--------------|
| Message Queues: |     |            |             |       |       |        |              |
| q               | 200 | 0x000003e8 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 201 | 0x000008fc | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 202 | 0x00001991 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 203 | 0x000005dc | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 204 | 0x00000640 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 205 | 0x000004b0 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 206 | 0x00000708 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 207 | 0x00000e74 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 208 | 0x00000960 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 209 | 0x0000041a | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 210 | 0x000006a4 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 211 | 0x00000898 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 212 | 0x00000c80 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 213 | 0x00002198 | -Rrw-rw-rw- | root  | sk    | 0      | 0            |
| q               | 214 | 0x0000157c | -Rrw-rw-rw- | CNMS  | sk    | 0      | 0            |
| q               | 215 | 0x0000157d | -Rrw-rw-rw- | CNMS  | sk    | 0      | 0            |
| q               | 216 | 0x000019c8 | -Rrw-rw-rw- | CNMS  | sk    | 0      | 0 (See note) |

#### Screen 7-11. Sample Display for the ipcs command

**CBYTES** = The number of bytes in messages currently outstanding on the associated message queue.

**QNUM** = The number of messages currently outstanding on the associated message queue.

The KEY field represents a *StarKeeper II* NMS process. All of the above-listed processes must be present when the *StarKeeper II* NMS is operating. The table below matches the hex code (KEY field), and the decimal equivalent, with the *StarKeeper II* NMS process name; the fourth column shows how the process name is shown (abbreviated) when using the **ps** command. See the previous section titled **Checking the Active Processes**.

**Table 7-7. Hex Code and Decimal Code to Process Name Correlation**

| Hex Code   | Decimal | Process               | "ps" name |
|------------|---------|-----------------------|-----------|
| 0x000003e8 | 1000    | Monitor               | cnms_mon  |
| 0x000008fc | 2300    | CNMS Logger           | elogger   |
| 0x00001991 | 6545    | Session Control       | sc        |
| 0x000005dc | 1500    | Message Identifier    | parse     |
| 0x00000640 | 1600    | Message Distributor   | distr     |
| 0x000004b0 | 1200    | Console Doorway       | door      |
| 0x00000708 | 1800    | Alarm Handler         | alarmd    |
| 0x00000e74 | 3700    | Alarm Action          | al_action |
| 0x00000960 | 2400    | Performance Collector | pcollect  |
| 0x000006a4 | 1700    | Billing Collector     | bcollect  |
| 0x00000898 | 2200    | Pi Distributor        | pid       |

**Table 7-7. Hex Code and Decimal Code to Process Name Correlation**

| Hex Code   | Decimal | Process             | "ps" name |
|------------|---------|---------------------|-----------|
| 0x0000c80  | 3200    | Pi Exec'er Process  | pie       |
| 0x00002198 | 8600    | Report Server       | prep_srv  |
| 0x0000157c | 5500    | Focus Data Gatherer | fdg       |
| 0x0000157d | 5501    | Database Server     | dbserver  |
| 0x000019c8 | 6600    | Database Exec'er    | dbexec    |
| 0x0000041a | 1050    | DK Poller           | dkpoller  |
| 0x00000514 | 1300    | BDT Manager         | ncsbdtd   |
| 0x00002260 | 8800    | Flat File DB Loader | ff_dbload |

**⇒ NOTES:**

You may see more than one dbexec process running.

If you start up a **netdisp** or **alarms** process, a message queue also is created.

Ideally the CBYTES and QNUM fields should be zero. If the *StarKeeper II* NMS starts to get busy (that is, numerous billing records coming in, numerous alarms coming in), the CBYTES field and QNUM field start to increase. For *StarKeeper II* NMS to be working properly, the processes should be reading their own queues and taking the messages off the queue continuously. The number of messages should never stay at the high point.

The maximum number of bytes allowed on a message queue is 21600. If CBYTES approaches 21600 on a queue, check to make sure that the corresponding process responsible for that queue is still present in the process table. The user can check for the process by entering the OS **ps -ef** command. Check *\$EVENTLOG/<current\_log>* to see if there are any error indications. If a CNMS process dies, an alarm is issued and the Event Log is updated with an error message.

For example, if you enter **ipcs -qo** and the results indicate that KEY 708 (the alarm handler process) has CBYTES of 21600, the process may have terminated abnormally or the messages are arriving faster than they are being processed. You can check the status of the *StarKeeper II* NMS process corresponding to the key. If the process terminates as a result of an abnormal condition, save the Event Log to assist in troubleshooting the problem. If the process is still running, this suggests that messages are arriving faster than they are being processed and overflow messages will be spooled onto disk files. See the next subsection, **Message Queue Overflow** for more details.

## Message Queue Overflow

If messages arrive faster than the receiving process can accept and process them, the queue limit of 21600 bytes may eventually be reached. In the event of an overflowed queue, *StarKeeper II* NMS saves messages to a disk file, and when room becomes available on the associated queue, messages will then be sent to that queue.

The disk files are stored in the `/usr/SKspool` directory, and are named: `SP[SKmsgqid].0` and `SP[SKmsgqid].1`; where `SKmsgqid` equals the *StarKeeper II* NMS Message QID in decimal (see Table 7-7). There are two spool files, thus the `.0` and `.1` suffixes, when one spool file fills up the messages are routed to the other.

For each queue that is actively spooling, there will be a “topspooler” process running responsible for reading messages from the disk file and sending it to the associated queue. The `ps -ef` output will show the topspooler process that is running. The `-s [SKmsgqid]` argument identifies the process that is actively spooling. The topspooler process will remain active for 15 minutes after message spooling has finished and then terminate. A message is logged in the Event log indicating when the topspooler process has started and stopped.

```
63002 REPORT CNMSMSG topspooler: Topspooler process has
 been started for queue 1000.
```

There is always a topspooler process running for the Monitor. Therefore, there will always be an open file in `/usr/SKspool: SP1000.[01]`. The Monitor topspooler runs with the `“-s 1000”` command line option (see the first entry in Table 7-7).

If there are more than five topspooler processes running at the same time, it could be an indication of system-wide message sending problems.



### CAUTION:

*Keep approximately 5000 blocks free in the /usr file system to accommodate possible message spooling.*

## Other Problems

---

Problems experienced when running the system may not be *StarKeeper II* NMS problems at all; they may be operating system or hardware problems. The material in this section will help you determine where the problem may lie, and provides the proper phone numbers to call and get help.

When you detect a problem on your *StarKeeper II* NMS machine, you should consult your user documentation for troubleshooting procedures. If the problem can not be resolved by executing the steps outlined in the documentation, further assistance is available by contacting the appropriate support organization.

To determine who to call, you should ascertain whether the problem is related to the *StarKeeper II* NMS software, or some other component of the system such as the operating system or hardware platform. Therefore, before making a service call, you should check if the problem you are experiencing is on the following list:

- difficulty in restoring full system backups
- failure to reboot machine after a system crash
- inability to log on as root
- errors on console
- swap space messages
- setting up printers
- hardware problems, such as disk errors or tape drive problems

If the problem is listed above, contact one of the appropriate support organizations listed below:

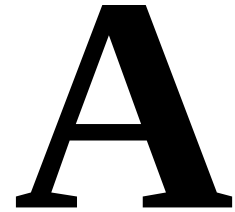
|                                       |                                  |                                 |
|---------------------------------------|----------------------------------|---------------------------------|
| For HP hardware or software:          | HP Response Center               | 1-800-633-3600                  |
| For <i>StarKeeper II</i> NMS software | Customer Assistance Center (CAC) | 1-800-WE2-CARE (1-800-932-2273) |





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# Installing *StarKeeper* II NMS



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## Overview

The installation process for *StarKeeper* II NMS is dependent on the type of packaging of the system that you purchased. There are currently two types: *staged systems*, and *upgrade software packages*.

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## Staged Systems

*StarKeeper* II NMS can be purchased as a staged system, which consists of an HP C200 workstation that has been pre-configured with all HP-UX system software, with *StarKeeper* II NMS Core System and/or Graphics System software, and with the hardware needed to support a fiber optic host connection to the hub node. For a staged system, installation involves

- assembling the host machine
- entering system parameters
- licensing proprietary software packages
- providing a host connection

---

## Upgrade Software Packages

If you purchased a new release of *StarKeeper* II NMS software for your existing *StarKeeper* II NMS, your installation involves

- loading *StarKeeper* II NMS installation software
- upgrading HP-UX system software
- licensing proprietary software packages

- if necessary, upgrading *StarKeeper* II NMS utility packages, such as INFORMIX
- loading *StarKeeper* II NMS software

### **StarKeeper II NMS Installation Process**

The *StarKeeper* II NMS installation process has been designed to make it easy to install your *StarKeeper* II NMS and to begin using it as soon as possible.

#### **⇒ NOTE:**

Do not use the external fast tape drive for installation.

Regardless of the type of installation you are performing, your installation is controlled by an automated program that provides step-by-step instructions, minimizing the chance for mistakes.

Information collected during the installation includes the name of your host machine, the service address of the hub node providing connectivity to your network, the configuration desired, licensing information, and so forth.

You will be asked to select the specific software packages that you want installed and installation will use this information to determine what to load onto your machine. Purchase Agreements will be shipped with your order. There will be one Purchase Agreement for each software package that you purchased. You should only select packages for which you have a corresponding Purchase Agreement.

INFORMIX licensing is required during installation if the installation procedures detect that INFORMIX is either not already installed on the system or must be upgraded. INFORMIX is always required for Core or Co-resident System configurations and is included in the *StarKeeper* II NMS installation tape. If needed, INFORMIX documentation and license keys are shipped with your *StarKeeper* II NMS order. You *do not* have to call Customer Support to get INFORMIX license keys.

Licensing of the *StarKeeper* II NMS software packages can either be done during installation or via the **sk\_license** command after installation has completed. Licensing is required for each of the software packages that you select during installation (which should correspond to the Purchase Agreements in your order). You will need to call Customer Support with the Purchase Agreement serial numbers and corresponding product descriptions so that license keys can be generated for each of the software packages. *The software will not be functional if it is not licensed.* Run **help** for a detailed description of the **sk\_license** command.

For your convenience, the key sequences used for editing are displayed below the form. Furthermore, a few lines of help text are displayed directly under the form. The help text describes the information that is needed for the current field (the cursor identifies the current field).

Other information collected during the installation includes the name of your host machine, the service address of the hub node providing connectivity to your network.

If you have not yet installed your host connection, which involves routing a fiber optic cable from your host machine to your hub node, installing a CPM-HS module in the hub node, and administering the hub node's database, a series of screens describe how to accomplish these tasks. If your node is not co-located with your host machine, we suggest you first copy some customized information from the displayed screens onto the hard-copy version, and then take the hard-copy instructions to the node so that you can easily complete the host connection.

### **Where Do You Go From Here?**

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- For Staged Systems:

Refer to the document entitled *Getting Started With StarKeeper II NMS R10.0 for Staged Systems* that was shipped with your order for detailed instructions on installing the StarKeeper II NMS hardware and for licensing your software.

- For Upgrade Software Packages

Refer to the document entitled *Getting Started With StarKeeper II NMS R10.0 for Upgrade Software Packages* that was shipped with your order for detailed instructions on installing the *StarKeeper II NMS* software.

Once the software installation is complete, use the *StarKeeper II NMS* **Display** command to verify the list of software packages installed on your system, as well as those packages that have been licensed. Run **help Display** for a detailed description of the command.



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## Configuring an Additional Disk

# B

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This appendix provides procedures for administering a second disk, internal or external, on your HP machine, after it has been installed. If you are adding the disk, refer to the HP manuals for hardware installation procedures.

The Node Software Download and Upgrade feature requires a separate 1-GB filesystem to isolate the node software files from the *StarKeeper II* NMS filesystem. If you are configuring a 715/100 to support the FRM-M2 function, you will need two 2-GB disks. The second disk will be dedicated to storing the database files in */usr2*, therefore, this disk does not have to be striped. To support the Node Software Download and Upgrade feature on the same machine as the FRM-M2 function, the node software must be loaded on */swdl*, which will be a directory on the first 2-GB disk. (The LOAD function will check the disk usage of */swdl* and prevent it from exceeding 1-GB.) For more details on this feature, refer to **Node Software Management**, in **Chapter 3**.

The separate 1-GB filesystem can be created on a 1-GB internal or external disk drive. Follow the steps in Procedure B-1 to configure a separate 1-GB filesystem to use the Node Software Download and Upgrade feature.

---

**Procedure B-1.     Configuring an External 2-GB Disk for *StarKeeper II* NMS Database Backup**

---

1. If the disk drive has not been installed in your system, complete the installation instructions provided with the disk.
2. If you are running VUE, exit from the VUE Login Window, select the Options button and select the No Windows option.
3. Log in as **root**.
4. Create a mount point for the new 2-GB disk by typing **mkdir /SK\_DBBK** and press .
- /SK\_DBBK* is the mount point for using the **-x D** option of the **skbackup/skrestore** command.
5. Issue the **ioscan** command to determine what the SCSI address is for the new disk.  
  
    For the remainder of this procedure it is assumed the SCSI address is 2.
6. Issue the following command to add the tape and disk to the system:  
  
    **insf -e -v**
7. Depending on vendor name and product id, execute the appropriate command below and substitute the appropriate device name to create the filesystem.  
  
    **/etc/newfs -F hfs -m0 -L -i8192 /dev/rdsk/c0t2d0** and press .
- The command line above is an example. You should use the actual scsi device of your disk drive.
8. Add the following entries, substituting the first field with the appropriate device name that is in the */etc/fstab* file:  
  
    **/dev/dsk/c0t2d0 /SK\_DBBK hfs defaults 0 2**
9. Type **chown cnmsadm /SK\_DBBK**.
10. Type **chgrp sk /SK\_DBBK**.
11. Type **chmod 775 /SK\_DBBK**.
12. Type **/etc/mount -a** to mount the filesystems.

### **Procedure B-2. Backing Up the SK\_DBBK Disk Using cpio**

---

1. Either log in as **root** or **su - to root**.
2. Change directory to /SK\_DBBK by entering: **cd SK\_DBBK**. Check the directory with **pwd**, the system will respond with /SK\_DBBK.
3. Type **ls MIH \*.cpio | cpio -oBv > device** where device is **/dev/rmt0m** for the regular tape drive or **/dev/rmt/skhc** for the fast tape drive.
4. Label the tape, including the device used to write the tape.

To read back from tape:

1. Either log in as **root** or **su - to root**.
2. Change directory to /SK\_DBBK by entering: **cd SK\_DBBK**. Check the directory with **pwd**, the system will respond with /SK\_DBBK.
3. Type **cpio -iBv < device** where device is **/dev/rmt0m** if the regular tape drive was used during backup or **/dev/rmt/skhc** if the fast tape drive was used during backup.
4. After reading the data back from the tape using the **cpio** command, enter **skrestore -x D** to restore it.

### Procedure B-3. Configuring the Fast Tape Drive

---

1. Once the tape has been installed on the system, either log in as **root** or **su -** to **root**.
2. The fast tape drive was given a SCSI address when it was configured. This address should **not** be 3 since this is an external tape drive (SCSI address 3 should be the internal tape drive). For the rest of this procedure it is assumed that the SCSI address for the fast tape drive is 1 (entries assuming a SCSI address of 2 are given in the notes following the entry).
3. Change directory by typing: **cd /dev/rmt**.
4. For an HP C-Class UNIX workstation, enter:

**⇒ NOTE:**

This is for a SCSI address at address 2.

***mknod skhc c 205 0x012000.***

For an HP 715 UNIX workstation, enter:

***mknod skhc c 205 0x002000.***

5. For an HP C-Class UNIX workstation, enter:

**⇒ NOTE:**

This is for a SCSI address at address 2.

***mknod skhcn c 205 0x012040.***

For an HP 715 UNIX workstation, enter:

***mknod skhcn c 205 0x002040***

6. Enter ***chmod 666 skhc.***
7. Enter ***chmod 666 skhcn.***



---

## Reconfiguring HP-UX System Parameters

# C

---

HP-UX system parameters are set during the installation of *StarKeeper II* NMS. When starting the *StarKeeper II* NMS software, the system performs a check to verify that the tunable parameters required for *StarKeeper II* NMS operation are correctly set. If the tunable parameters are not set properly, the system displays the following message:

**\*\*FATAL\*\***

***StarKeeper II* NMS failed to start.**

The current size of the process table (500)  
does not match the value set by *StarKeeper II* NMS (507).  
Follow the documented procedures for reconfiguring  
your system parameters.

If you must reconfigure the tunable HP-UX system parameters after you have installed *StarKeeper II* NMS, (for example, after an HP Host upgrade), follow Procedure C-1 for a Core or Co-resident System; follow Procedure C-2 for a Graphics System.



### **WARNING:**

*This procedure reboots the HP-UX System.*

### Procedure C-1. Reconfiguring Tunable HP-UX System Parameters for Core or Co-resident Systems

---

1. From the **Console Login** prompt, login as **cnmsadm**. If your system is already running in HP VUE, you can get to the **Console Login** prompt by selecting **No Windows** from the **Options** menu.
2. Enter **cd \$CNMS\_ROOT/lib/sysadm** at the prompt and press .
3. Enter **./unixmgmt -r** at the prompt and press . The following screen appears. You are prompted to enter the root password.

This function will reconfigure tunable HP-UX system parameters for StarKeeper II NMS operation.

Press c to continue or q to quit :

4. Enter **c** and press  to continue with the process. A screen appears, announcing the HP-UX parameters and the *at config* file are modified.

HP-UX system parameters are reconfigured.

The machine automatically reboots. This function is necessary for the HP-UX system parameters to take effect.

### Procedure C-2. Reconfiguring Tunable HP-UX System Parameters for Graphics Systems

---

1. From the **Console Login** prompt, login as **root**. If your system is already running in HP VUE, you can get to the **Console Login** prompt by selecting **No Windows** from the **Options** menu.
2. Enter **. /usr/pub/AP\_ROOT** and press .
3. Enter **\$AP\_ROOT/bin/tunews** and press .

The machine rebuilds the kernel and reboots. These functions are necessary for the HP-UX system parameters to take effect.

---

## Connecting a Printer

# D

---

This appendix provides instructions on how to connect a printer to a *StarKeeper II* NMS host machine, how to verify the printer connections, and how to troubleshoot problems.

### Printer Connections

A *direct connection* means that a cable runs from the printer into the serial or parallel port connector of the System Unit. Direct connections are used to support printer sharing through a Local Area Network (LAN). *Printer sharing* allows a printer that is directly connected to a *StarKeeper II* NMS machine (called the spooling host) to be shared by a remote *StarKeeper II* NMS machine. Printer sharing can be accomplished via the LAN.

The instructions explain how to configure a system for a direct connection to a printer, and then explain how to configure the system for printer sharing.

Printers previously configured and not added to the HP-VUE environment do not show on the printer button for the HP-VUE front panel. To display and activate these printers for HP-VUE, the printers must be deleted and added through SAM and be included in the HP-VUE front panel (one option when adding a printer).

The following procedure explains how to remove a printer previously administered using the **lpadmin** command:

#### **Procedure D-1. Removing Printers Administered via lpadmin Command**

1. Log in as **root**.
2. To shut down the scheduler, type **/usr/sbin/lpshut**.
3. To remove the printer, type **/usr/sbin/lpadmin -x<printer name>**, where **<printer name>** is the specific name of the printer to be removed.
4. To restart the scheduler, type **/usr/sbin/lpsched**.

The printer can now be added to HP-VUE using SAM.

## **Printer Configuration Recommendations**

---

The recommended way to use the print capability on a *StarKeeper* II NMS machine is to connect the printer directly to a *StarKeeper* II NMS machine and remotely access printer-sharing capability.

Recommended printers in this category are the HP DeskJet® 870C, HP LaserJet® 6P, and any HP LaserJet printer (without a Postscript® cartridge). These printers are used in *StarKeeper* II NMS to print any of the following:

- ASCII billing reports, performance reports, and alarm reports
- the *StarKeeper* II NMS database schema (using the **skschema** command)

On a *StarKeeper* II NMS Graphics System or Co-resident System, graphics printers may be installed and configured. Recommended printers in this category are the HP DeskJet 870C and HP LaserJet 6P without a Postscript cartridge. If you use a LaserJet IIP or LaserJet IIIP, do not install the Postscript cartridge. These printers are used in *StarKeeper* II NMS to print the following:

- Graphics application screen dumps
- Performance Reporter graphs

## **Printer Hardware Installation**

---

For instructions on how to unpack and set up the printer, refer to the appropriate HP documentation.

### **Procedure D-2. Installing an HP DeskJet 870C or LaserJet 6P Printer**

---

1. Make sure that the printer power switch is in the OFF position.
2. Insert one end of the parallel interface cable into the parallel (Centronics) port on the printer.
3. Insert the other end of the interface cable into the parallel port connector at the back of the System Unit.
4. Insert the female end of the power cable into the power module at the back of the printer.
5. Plug the male end of the power cable into the power source.
6. Load the printer with paper as recommended in the appropriate HP setup guide.
7. Turn the power switch to the ON position.

## Printer Administration

---

The SharedPrint/UX software allows you to access a local printer or remotely access a printer connected to an HP machine from other HP machines connected via a LAN. To configure a printer directly connected to your *StarKeeper II* NMS machine, complete Procedure D-3. To set up a remote access for other machines on the LAN, complete Procedure D-4.

The SharedPrint/UX software is already installed in the system by the *StarKeeper II* NMS Installation. You should have a *SharedPrint/UX User Guide* and an *Administrator's Guide* on hand for the following software installation.



### NOTE:

Only attempt the following after *StarKeeper II* NMS installation.

### Procedure D-3. Configuring a Local Printer

---

If the host has a local printer installed to a serial or parallel port, complete these procedures to configure the printer.

1. Log in as **root**.
2. Use HP **SAM** to add this printer to the system as follows:
  - a. Type **/usr/sbin/sam** to start running SAM.
  - b. Highlight **Printers and Plotters** and activate the Open control button.
  - c. Highlight **LP Spooler**
  - d. Choose **Printers and Plotters**.
  - e. Choose **Add Local Printer/Plotter >** and the menu item associated with the printer interface type from the **Actions** menu. For example, **Add Parallel Printer/Plotter** for a parallel interface or **Add Serial (RS-232) Printer/Plotter** for a serial interface.
  - f. If the printer interface type is a parallel interface, click **OK** for **Parallel Printer/Plotter Hardware Location**.

If the printer interface is a serial interface, pick up the top **Hardware Path** for a serial port a (1) or pick up the bottom Hardware Path for serial port b (2). Click **OK** on the screen.

- g. When the **Add Local Printer/Plotter** screen appears, complete the fields as follows:

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Printer Name -</b>                         | Enter a meaningful name for this printer.                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Printer Model/Interface -</b>              | Enter the abbreviated name that designates the specific local printer model/interface that is being added. For example, pick the following:<br><b>DJ870C</b> for the DeskJet 870C,<br><b>LJ6P</b> for the LaserJet 6P,<br><b>DJ560C</b> for the DeskJet 560C,<br><b>PJ</b> for the Paint® Jet color printer,<br><b>LJ4M</b> for the LaserJet 4m printer,<br><b>LJIIP</b> for the LaserJet IIP printer, or<br><b>LJIIP</b> for the LaserJet IIP printer. |
| <b>Printer Class -</b>                        | Skip this field.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Default Request Priority -</b>             | Use the default.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Make this the system default printer -</b> | Push the toggle button.                                                                                                                                                                                                                                                                                                                                                                                                                                 |

- h. When asked if you want to add this printer to the HP VUE front panel indicate **yes**.
3. To enable other systems to access this printer via the LAN, complete the following steps:

- a. Edit the file */etc/inetd.conf* by searching for the following line and removing the # symbol in column 1 if it exists.  

```
#printer stream tcp nowait root /usr/lib/rlpdaemon rlpdaemon -i
```
- b. Enable this daemon by executing the command:

***/etc/inetd -c***

4. If the printer is connected to a serial line, perform the following steps:

- a. Set the system's serial line parameters by typing the **set\_tty.sh** command; where: **io\_port** is printer device name supplied by **SAM** and **speed** is the printer baud rate.

***/opt/sharedprint/lbin/set\_tty.sh io\_port speed***

For example, if you were setting up a printer with an **io\_port** of **/dev/lp\_myprinter** and a baud rate of **19200**, you would enter:

***/opt/sharedprint/lbin/set\_tty.sh /dev/lp\_myprinter 19200***

If you are unsure about which **io\_port** is used, type **lpstat -v**.

The output from this command has the following format:

device for printer\_name: io\_port

- b. Set the printer's interface characteristics according to documentation supplied with the specific printer. If the following parameters exist, set them as shown here:

**interface -** *serial*

**handshake -** *serialxon/xoff*

**speed or baud rate -** whatever speed you used in the preceding step

#### **Procedure D-4. Configuring Remote Access via the LAN**

---

Complete these steps on each *StarKeeper II* NMS host system that needs to access a printer on another system for which a LAN connection is available.

1. Log in as **root** on the remote *StarKeeper II* NMS host, the system needing access to the printer.
2. Use HP **SAM** to do the following:

- a. Type ***/usr/sbin/sam*** to run **SAM**.
- b. Highlight **Printers and Plotters**, and active the Open control button
- c. Highlight **LP Spooler**.
- d. Highlight **Printer and Plotters**.
- e. Highlight **Menu Bar**.
- f. Choose **Add Remote Printer/Plotter** from the **Actions** menu.
- g. Enter the following for these fields:

**Printer Name -** Enter the name used by the local system for the printer you wish to access from this host.

**Remote System Name -** Enter the name of the host system to which this printer is physically connected.

**Remote Printer Name -** Enter the same name used for Printer Name.

- h. When asked if you want to add this printer to the HP VUE front panel say **yes**.
- i. Start up the **LP Spooler**, if it is not already running.
- j. Exit **SAM**.

#### Procedure D-5. SharedPrint Known Problem

---

If you see the following message displayed on the console:

```
INIT: Command is respawning too rapidly
Will try again 5 minutes
Check for possible errors
id:ShPr "/etc/sharedprint/bin/spserver"
```

The following steps resolve the problem:

1. Log in as **root**.
2. Make sure you are in **/** (the root directory)
3. Type **/etc/reboot** and press .

#### Procedure D-6. Printing Banner Pages

---

To get a banner page from a particular printer using **SharedPrint**, complete the following steps:

1. Move to the file `/etc/opt/sharedprint/printer_name.pcf`, where `printer_name.pcf` is the name of the specific printer to which you want to print banner pages.
2. Locate the following text line:
  - a. For laserjet printers:  
`#front_banner=/etc/sharedprint/banners/banner_pcl`
  - b. For deskjet printers:  
`#rear_banner=/etc/sharedprint/banners/banner.sh`
3. Remove the comment character `#` from the text and write the file.



## **Default Printer**

---

You can have multiple printers connected to your *StarKeeper II* NMS machines. They can be direct connections or shared printers. To verify or change the default printer, use the following procedure.

### **Procedure D-7. Verifying and/or Changing the Default Printer**

---

1. Log in as **root** and press .
2. Type **lpstat -d** and press .

The default printer name is displayed. If you want to change the default printer to root, use this command:

```
/etc/lib/lpadmin -d <printer name>
```

## **Printing on the Whole Page**

To print on the whole page, use the following procedure.

### **Procedure D-8. Print the Whole Page, not Just in the Corner**

---

1. Log on to the spooling host as **root** and press .
2. Use your preferred editor to locate the following line in the */etc/opt/sharedprint/<printer name>.pcf* file:  

```
#fitpage=on
```
3. Delete the # character and save the file.

The printing now occurs on the whole page.

## Removing the Remote Host

If you used **dkdo** to print in pre-R10.0, use the following procedure to unlink the **dkdo** command from the remote host using the **lp** and **lpstat** commands. Users on the remote host cannot use the **lp** and **lpstat** commands, and cannot have their print jobs queued transparently on the spooling host.

### Procedure D-9. Removing the Remote Host

1. Log in to the remote host as root and press .
2. Type **mv /usr/bin/Olp /usr/bin/lp** and press .
3. Type **mv /usr/bin/Ocancel /usr/bin/cancel** and press .
4. Type **mv /usr/bin/Olpstat /usr/bin/lpstat** and press .
5. Using your preferred editor, find and delete a line similar to the following at the bottom of the */etc/opt/dk/newconfig/dkhosts* file:

**<system\_name\_of\_spooling\_host> dflx <dialstring> -**

The end of the */etc/opt/dk/newconfig/dkhosts* file appears as follows:

```
This entry is for a printer and the only service supported on the host
"printa" is printer (p). The call to the printer "printa" is placed
through the network with a destination dialstring of
"myarea/myexch/printa".
```

```
printa p myarea/myexch/printa -
```

6. Write and exit the */etc/opt/dk/newconfig/dkhosts* file.
7. Using your preferred editor, find the following lines in the */etc/opt/dk/newconfig/dkdotab* file. (In the example given earlier in this appendix, the system name of the spooling host was **skws**. Using that example, the *dkdotab* file appears as follows:)

```
The following is an example that specifies that execution of the
lp(1) command from the local Datakit VCS/ISN host be executed on the remote
Datakit VCS/ISN host "hosta".
The arguments associated with the options of the lp(1) command (d,n,o,t)
may follow directly or indirectly after the lp(1) option specification.
The files associated with execution of this command are input files
and a flag of "-c" should be inserted on the lp(1) command line before
it is invoked on the remote machine. See dkdotab(4) for additional details.
```

```
lp hosta - d:n:o:t:-c:<*
lp skws - d:n:o:t:-c:<*
lpstat skws - -
cancel skws - -
```

8. Using your preferred editor, find and delete three lines having the following format:

```
lp <system name of spooling host> - d:n:o:t: -c:<*
lpstat <system name of spooling host> - - -
cancel <system name of spooling host> - - -
```

The *dkdotab* file should now appear as follows:

```
The following is an example that specifies that execution of the
lp(1) command from the local Datakit VCS/ISN host be executed on the remote
Datakit VCS/ISN host "hosta".
The arguments associated with the options of the lp(1) command (d,n,o,t)
may follow directly or indirectly after the lp(1) option specification.
The files associated with execution of this command are input files
and a flag of "-c" should be inserted on the lp(1) command line before
it is invoked on the remote machine. See dkdotab(4) for additional details.
```

```
lp hosta - d:n:o:t: -c:<*
```

For more information, refer to **dkdotab(4)** in the Host Interface document.

## **Verifying the Printer Connection**

---

Once you have connected your printer(s), verify that your setup is correct with the following procedure.

### **Procedure D-10. Sending Test Output to the Printer**

---

You can test whether the printer works by sending any file as output to be printed. In this procedure, we will use the system profile as the data to print.

1. Log in as **root** and press .
2. Send the test file to the system default printer by entering the command:  
***# cat /etc/profile | lp***
3. If you have more than one printer connected to your system, either locally or as a shared print device, test each printer by entering the following command:

***# cat /etc/profile | lp -d<printer name>***

Your output is spooled and routed to the named printer. If the output does not print on the named printer, refer to the **Troubleshooting Guidelines** section for help.

## **Troubleshooting Guidelines**

---

Once you have completed the procedures in this appendix, check the printer installation and administration, and the printer documentation.

If you have trouble obtaining printer output, complete the following procedure to determine the cause.

### **Procedure D-11. Troubleshooting the Printer**

---

1. Check the *StarKeeper II* NMS log files for errors related to the printer. Examine the */var/spool/lp/log* file on both the local and remote system. This file traces jobs through the LP queuing system.
2. If you cannot isolate the problem from information in the log files, run more test printouts using the method shown in Procedure D-10.
  - a. Start with the host to which the printer is directly connected and work your way to the remote host that requests printed output.
  - b. Review the log files for any information that may explain the print failure.
  - c. Run */usr/bin/lpstat* from the system where the problem exists. If this is successful, then the LP and the host interface are configured correctly.
  - d. Try to establish a connection between the remote and spooling host using the node **dkcu** command to ensure the hosts are communicating.



---

## Host and HP Administration

# E

---

### System Administration Tasks

---

#### Setting the Root Password

---

##### Procedure E-1. Set the Root Password

---

You must be logged in as **root**.

1. At the # prompt, type **passwd** and press .
2. Enter the new password at the New password: prompt and press .
3. Do not simply press  or you will not be able to log in. You *must* supply a legitimate password.
4. Re-enter the password at the Re-enter new password: prompt and press .

---

#### Modifying the System IP Address and/or Hostname

During *StarKeeper II* NMS installation, you are given the option to modify your system IP address and host name. If you would like to change this information after installation is completed, follow the procedures outlined below or re-run the *StarKeeper II* NMS installation forms. Be aware that changing the host name requires modifications to any existing Network Monitor maps.

If you modify the IP address or host name without following these procedures, your system may be inoperable. When you execute these procedures users should NOT be logged on the system. *StarKeeper II* NMS software is terminated and the system is in single user mode.

If the *StarKeeper* II NMS software is currently running, stop the software. If this is a Core or Co-resident System, login as *cnmsadm* and use *SKsh* to shutdown the software. If it is a Graphics System, execute the *\$AP\_ROOT/stopws* command.

## Modifying the IP Address

### Procedure E-2. Modifying the IP Address

---

1. Log in as **root**.
2. Enter **/usr/sbin/shutdown** and press  to bring the system to single user mode.
3. Enter **/sbin/set\_parms ip\_address** and press .
4. Enter the new IP address when prompted. This change does not take effect until the system is rebooted.
5. Select **y** to reboot the system.

When the machine returns to multi-user mode, the system is ready for users to login via the new IP address.

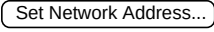
## Modifying the System Hostname

### Procedure E-3. Modifying the System Hostname

---

1. Log in as **root**.
2. Enter **/usr/sbin/shutdown** and press  to bring the system to single user mode.
3. Follow the procedures in the section **Administering the Network Node** in this appendix to enter the new local address and local listener address at the node.
4. Edit the file **/opt/informix/etc/sqlhosts** and change **hostname**.
5. Enter **/sbin/set\_parms hostname** and press .
6. Enter the new host name when prompted. This change does not take effect until the system is rebooted.
7. Select **y** to reboot the system.
8. To ensure that the *StarKeeper* II NMS application software uses the correct name, perform the following after the system returns to multi-user mode:  
If this is a Core System,
  - via **SKsh**, **SYSADM** menu, choose the **SKIICONN** option. Edit the local service address and the local listener address parameters.If this is a Co-Resident System,



- via **SKsh**, **SYSADM** menu, choose the **SKICONN** option. Edit the local service address and the local listener address parameters.
- via the Network Monitor graphics application, select **Edit Maps** on the **Administer Maps** menu. Use  to edit the Network Address for this system on all maps that contain it.
- via the Workstation Administration graphics application, select **Cut-Through Apps** on the **Administer** menu. Edit the Name and Dialstring fields for the Local Environment.

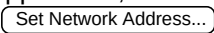
If this is a Graphics System,

- via the Workstation Administration graphics application, select **SK II Connections: Modify Local Parameters** on the **Administer** menu. Edit the local service address and the local listener address fields.
  - via the Workstation Administration graphics application, select **Cut-Through Apps** on the **Administer** menu. Edit the Name and Dialstring fields for the Local Environment.
  - via the Workstation Administration graphics application, select **Cut-Through Apps** on the **Administer** menu. Edit the Name and Dialstring fields for the system whose name has changed.
9. Perform the following on other *StarKeeper II* NMS systems in your network that connect to the system whose name has changed:

On Core and Co-Resident Systems,

- via **SKsh**, **CFCOMMAN** menu, change the System/Node for the system whose name has changed. Edit the Dialstring field in the SKII NMS Connection class.

On Graphics and Co-Resident Systems,

- via the Workstation Administration graphics application, select **SK II Connections: Add/Delete/Modify** on the **Administer** menu. Edit the System Name and Listener Address fields. Activate the connection again.
- via the Network Monitor graphics application, select **Edit Maps** on the **Administer Maps** menu. Use  to edit the Network Address for the system whose name has changed on all maps that contain that system.

## Establishing a Host Interface Connection

---

Before proceeding, be sure the EISA card and the BNC terminator are installed (as described in your assembly instructions). Complete these major steps to establish a host interface connection from the *StarKeeper II* NMS machine to the hub node:

1. Route the fiber optic cable and connect the fiber optic cable to the host machine EISA card.
2. Install the CPM-HS module in the node and connect the fiber optic cable to the CPM-HS module.
3. Administer the network node.

The on-screen installation instructions and the following subsections fully describe each task. If your node is not co-located with your host machine, you may find it convenient to bring these written procedures to the node when installing the CPM-HS board and administering the node database.

### **Routing the Fiber Optic Cable from CommKit to the CPM-HS Module**

---

#### **NOTE:**

This is a very technical section and should be read by the staff assigned the task of routing the fiber optic cable. Contact your support organization to determine who will be completing this procedure.

The purpose of this procedure is to lay fiber optic cable within a building to establish connections to the node.

### **Fiber Optic Cable**

The fiber optic cable provides the connection media between the host computer and the node. A fiber optic cable is a thin, lightweight flexible cable capable of conducting rays of light. The fiber optic cable that is used to connect the host computer to the node requires a straight-tip connector on both ends of the cable. The fiber optic cable may be run in overhead ceilings, in subfloor cable runs, and in riser shafts up to 500 feet. Before routing the fiber optic cable, you must connect rubber covers to each end of the cable. This protects the fiber optic cable from dirt or dust during installation.

When routing the fiber optic cable, keep the fiber optic cable away from copper riser cables. If you are unable to keep the fiber optic cable away from the copper riser cables, an inner liner (conduit) must be installed to keep the cables separated.

Carlton EFT corrugated tubing (or equivalent) may be used to separate the fiber optic cable from copper riser cables. This corrugated tubing can be used in short lengths and can be formed into bends.

#### **NOTE:**

Fiber optic cables are not intended for use in air handling ceiling areas unless installed in approved conduit.

When installing the fiber optic cable, avoid tight pulls or tugs against sharp corners of framework. If fiber optic cables are to be installed around sharp edges of cabinetry or framework, cover the edges with split tubing or similar material. When lacing or securing the fiber optic cable, use flat lacing twine or cable ties and do not tie the fiber optic cable extremely tight because microbending losses in the fiber optic cable may occur. Bundles of cables should not hang or protrude into the work space. Wrap the cables into loops not less than 3 inches in diameter, although short-term handling into loops of 1-inch diameter is satisfactory.

### Conduit Installation

The fiber optic cable was not designed for conduit installation, but it may be installed in conduit if the following principles are followed.

- Only two fiber optic cables are placed into a single conduit.
- The pull force of the fiber optic cable does not exceed 50 pounds per cable.

Fiber optic cables should not be pulled through more than four 90-degree bends. If the conduit run contains more than four 90-degree bends, intermediate "help" points should be provided. The minimum recommended conduit bend radius is 4.5 inches. Under no circumstances should the cable be pulled around a sharp corner such as a junction box connection.



#### **CAUTION:**

Do not install fiber optic cable in conduits with less than 3/4-inch inside diameter (ID).

Pulling tension during conduit installation can be minimized by following these principles:

- The fiber optic cable should enter the end of the conduit nearest the curved sections.
- Ducts or conduits should be free of foreign obstructions before cable installation.



#### **IMPORTANT:**

*Do not use a petroleum-based lubricant on PVC cables.*

- The following lubricants are recommended for PVC cabling:
  - American Polywater Corp.: Polywater<sup>®</sup> A&C
  - Arnco Equipment Co.: Hydralube Blue<sup>®</sup>
  - Neutral soft soap
  - Talcum powder

## **Installation Tools and Hardware**

Tools and hardware used to install copper wire and cable in building duct and conduit systems are satisfactory for use in installing fiber optic cable (such as fish wire, woven cable grips, or rope). If woven cable grips are used with fiber optic cables, tape them to the cable jacket before pulling the cable.

### **Connecting the Optical Fiber Cable to the Host Machine**

Connect one end of the fiber optic cable to CommKit in the host machine by completing the steps in the following procedure.

---

#### **Procedure E-4. Connecting the Cable to CommKit**

1. Remove the rubber covers from the fiber optic connectors on the cable and lock (push and twist) one of the fiber connectors to the RX (receive) connector on the board.
2. Lock the other fiber connector to the TX (transmit) connector on the board.

### **Installing the CPM-HS Module in the Node**

---

The CPM-HS board (and accompanying I/O board) must be installed in the node or in a Multipurpose Concentrator. The following procedures describe how to install the CPM-HS module in a node or concentrator.

A CPM-HS module and I/O board are required when using a fiber optic cable to connect the host computer to the node. The CPM-HS module is installed in an available slot at the front of the node. The CPM-HS module faceplate has a toggle switch, reset button, and three LEDs (enable, disable, and fault). The toggle switch allows you to enable or disable the host computer from the network. The reset button allows you to reset the CPM-HS module after a fault condition occurs. The three LEDs allow you to determine the state of the CPM-HS module.

The I/O board will be installed at the back of the node in the same numbered slot as the CPM-HS module. The I/O board has transmit and receive connectors that will be used to attach the fiber optic cable, and contains a LED to indicate a faulty optical connection.

---

#### **Procedure E-5. Installing and Connecting the CPM-HS Module**

1. Face the back of the node. Slide the I/O board into one of the available backplane slots. Push it firmly into the chassis.

2. Face the front of the node. Slide the CPM-HS module into the same numbered slot as the I/O board. Push it firmly into the chassis.
3. Enable the CPM-HS module by raising the faceplate toggle switch on the CPM-HS module.
4. Face the back of the node. Remove the rubber covers from the fiber optic cable connectors and lock (push and twist) one of the fiber connectors to the RX (receive) connector on the I/O board. Lock the other fiber connector to the TX (transmit) connector on the I/O board.
5. Make sure that the I/O board toggle switch is in the down position.
6. The bottom red LED on the I/O board will be on if the optical connection is faulty. If the LED is on, reverse the transmit and receive fiber connectors at the I/O board. If the LED remains on, ensure that the fiber optic cable is connected to CommKit at the rear of the host machine. If the LED remains on, there is a hardware problem with either CommKit, the CPM-HS, or the fiber optic cable. Review all preceding steps before contacting support personnel.

## **Administering the Network Node**

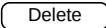
---

At this point, you must complete some administrative tasks for your network node.

### **Administering the CPM-HS in the Node Database**

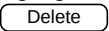
This section provides procedures to complete node administration, which involves entering the group name, defining the service address for the dkserver, defining the service address for the listener, and administering the CPM-HS in the node database. These procedures apply to the nodes.

### **Entering the Group Name**

At the node console, enter the group name as shown in the following screen. The node console prompt is shown as ">" in this example; your responses are *highlighted*. The responses <Enter> and <Delete> mean to press  or  of the node console.

```
> enter group
GROUP [up to 8 chars]: <your host machine name>
ENTER [local, trunk: +(local)]: local
DIRECTION [originate, receive, 2way]: 2way
DEVICE OR HOST [up to 8 chars]: <your host machine name>
NETWORK ACCESS PASSWORD [up to 8 chars]: <Return>
ROUND ROBIN SERVICE [per_port, per_module, none +(none)]: none
GROUP [up to 8 chars]: <Delete>
```

## Defining the DK Server Address

At the node console, enter the dkserver address as shown in the following screen. Note that the lowest level of the dkserver address is the host machine name. The node console prompt is shown as ">" in this example; your responses are *highlighted*. The responses <Enter> and <Delete> mean to press  or  of the node console.

```
> enter address
LEVEL network, area, exchange, local, speedcall +(local)]: <Enter>
TYPE [x121, mnemonic, both +(mnemonic)]: <Enter>
MNEMONIC ADDRESS [up to 8 chars]: <your host machine name>
PAD SUPPORT [yes, no +(no)]: <Enter>
DIRECTORY ENTRY [up to 30 chars double quoted, none +(none)]: <Enter>
GROUP(S) [up to 4 groups separated by commas, none +(none)]: <host machine name>
ORIGINATING GROUP NAME SECURITY PATTERN(S)
[comma-separated pattern list. same_as, none +(none)]: <Enter>
INITIAL SERVICE STATE [in, out +(out)]: in
ADDRESS [up to 8 chars]: <Delete>
```

## Defining the Service Address for the Listener

At the node console, enter the local listener address as shown in the following screen. Note that the local listener address is the host name in all capital letters. The node console prompt is shown as ">" in this example; your responses are *highlighted*. The responses <Enter> and <Delete> mean to press  or  of the node console.

```
> enter address
LEVEL network, area, exchange, local, speedcall +(local)]: <Enter>
TYPE [x121, mnemonic, both +(mnemonic)]: <Enter>
MNEMONIC ADDRESS [up to 8 chars]: <HOST MACHINE NAME IN ALL CAPS>
PAD SUPPORT [yes, no +(no)]: <Enter>
DIRECTORY ENTRY [up to 30 chars double quoted, none +(none)]: <Enter>
GROUP(S) [up to 4 groups separated by commas, none +(none)]: <host machine name>
ORIGINATING GROUP NAME SECURITY PATTERN(S)
[comma-separated pattern list. same_as, none +(none)]: <Enter>
INITIAL SERVICE STATE [in, out +(out)]: in
ADDRESS [up to 8 chars]: <Delete>
```

## Configuring the CPM-HS

At the node console, enter the CPM-HS module as shown in the following screen. The node console prompt is shown as ">" in this example; your responses are

*highlighted*. The responses `<Enter>` and `<Delete>` mean to press  or  of the node console.

```
> enter cpm
MODULE ADDRESS: <Enter your CPM-HS slot number>
COMMENT [up to 60 chars double quoted]: <Enter>
HARDWARE TYPE [422, hs +(hs)]: <Enter>
NUMBER OF CHANNELS [3-512: +(32)]: 256 (See Note below)
SINGLE OR MULTIPLE GROUP(S)[single, multiple +(single)]: <Enter>
GROUP [up to 8 chars]: <your host machine name>
ENDPOINT NUMBER OR RANGE [0000-9999, none +(none)]: <Enter>
MODULE ADDRESS [up to 8 chars]: <Delete>
> restore cpm <CPM-HS slot number>
```

**NOTE:**

The actual number of channels is the value you entered on the Network Parameters screen, which appeared on the Host Connections screen, as displayed during installation.

## Problems Establishing a Host Interface Connection

---

If you cannot establish a host interface connection to the node, complete the following procedures.

### Check Communication Path

To check your host connection, log on to your host machine, enter **dkcu** `<hostname>`, and press .

If you get a **login** prompt, your host connection is working. (Enter `~.` to close the connection.) If you get an error message (for example: `call failed`), your host connection is faulty; proceed with the next section.

### Verifying HP Host Interface Hardware and Software

To verify that the host computer can communicate successfully with the node, you must be logged in as **root** on the host computer and the system must be in the multi-user mode (run level 2). The following is an overview of these step-by-step procedures:

1. Verify operation of the Host Interface server.
2. Verify terminal login across the Host Interface.

3. Verify data transfer across the Host Interface.

### Starting the Host Interface Server

To test the newly installed interface, the Host Interface server must be started. The Host Interface server (*/opt/dk/bin/dkserver*) is started automatically whenever the system enters **init** state 2. This was done when the machine booted up.

#### Procedure E-6. Starting the Server

Before starting the Host Interface server, complete the following steps.

1. At the node console: verify that the CPM-HS is in service (IN\_SVC) by entering **verify module N** (where N is the number of the slot in which the CPM-HS resides in the node) and press . The following is the system response for a CPM-HS in slot 6.

```
CC> verify module 6
98-01-01 10:05:37 NODE=XYZ
M verify module 6
 SLOT 6 CAB 0 HTYPE cpmhs NCNLS 155 STYPE unix IN_SVC
 HOST: hosta
 GROUP: hosta
```

2. If the output of the **verify module** command shows that the CPM-HS is out of service (OUT\_OF\_SVC), the CPM-HS module must be restored to service. Enter **restore cpm XX** (where **XX** is the number of the slot in which the CPM-HS is located in the node, for example, restore cpm 06) and press  on the node console.
3. Verify that the server name to be used by *dkserver* is in service. Enter **verify address local <hostname>** (where **<hostname>** is the name of your host machine) and press  on the node console. The following is an example of the system response for an in-service address: **verify address local hosta**. A message similar to the following appears:

```
98-01-01 15:59:50 NODE=XYZ
M verify address local hosta
MNEMONIC ADDRESS: hosta X.121 ADDRESS:
LEVEL: local SERVICE STATE: in
DIRECTORY: none
SECURITY: none
```

4. If the output of the **verify** command shows the name is out of service, the name must be restored to service. Enter **restore address local <hostname>** (where **<hostname>** is the name of your host machine) and press  on the node console.



5. To start the Host Interface server, enter ***/opt/dk/bin/dkitrc start*** and press Return.

All logged server activity is written to the default logfile:  
*/var/opt/dk/log/dksrvlog*

6. To verify that the Host Interface server has been started, examine the last few entries in the server log (default is */var/opt/dk/log/dksrvlog*). A successfully started server logs the following two messages:

```
SERVER <name> is INITING files=(<srvtab> <uidtab>) loglvl=<n>
dkmgr: SERVER <hostname> is ACTIVE and SERVING
```

where:

**<hostname>** is the name of your host machine,  
**<srvtab>** is the Host Interface server table,  
**<uidtab>** is the Host Interface user-id table,  
**n** is the level at which the server activity is logged.

7. Once it is verified that the server has started, verify that the server is actually communicating with the node. At the node console, enter ***display connections mod N*** (where *N* is the number of the slot in which the CPM-HS resides) and press Return.

This command displays a summary of the virtual circuits that are active on the Host Interface. The output of the ***display connections*** command should verify that at least one Host Interface channel is in the **SERVING** state. If it is not, then the Host Interface server (*/opt/dk/bin/dkserver*) is not successfully communicating with the node and you should now consult your documentation for the Host Interface.

The following is an example of the ***display*** command for a CPM-HS in slot 6:

***display connections mod 6***

```
98-01-01 14:41:35 NODE=XYZ
M display connections mod 6
MOD CHL/ GROUP PKT CNT STATE MOD CHL/ GROUP PKT CNT
ADDR PORT ADDR PORT
 6 1 **** 57563 ACTIVE
 6 2 hosta 149 SERVING
```

8. You should now be able to enter ***dkcu <hostname>*** at the host machine and get a login prompt. Enter ***.*** to leave the login prompt.

## Verifying Host Interface Data Transfer

### Procedure E-7. Verifying Host Interface Data Transfer

---

1. The Host Interface load command **/opt/dk/bin/dkload** (see **dkload** in the documentation for the host interface) executes a loop-around data transfer to load test and check for possible errors and/or problems on the Host Interface. **/opt/dk/bin/dkload** sets up a virtual circuit between one or two Host Interface hosts, and then, sends and receives data over the circuit.

2. The format of the Host Interface load function is as follows:

```
/opt/dk/bin/dkload dialstring.dkload [-s <messagesize>]
[-n <number of iterations>] [-l <logfile>]
```

3. To run a loop-around load test on a host, the **dkload** function must be run from the host. The dialstring of this host must be specified as the destination computer on the command line of **dkload**.

In addition, there must be a **dkload** service in the */etc/opt/dk/dksrvtab* table on the destination host. The default *dksrvtab* has this service already included. For example:

```
/opt/dk/bin/dkload <hostname>.dkload -s 512 -n 1000 -l /tmp/dklog
```

where **<hostname>** is the name of the host as known by the node. This results in 1000 messages of size 512 bytes each to be sent loop-around to and from the host **<hostname>** and the results of the test sent to the file */tmp/dklog*.

4. To verify that the tests have passed, tail the file */tmp/dklog*. There should be entries in the *log* file similar to the following:

```
PID: LOCAL TEST FINISHED OK at DATE nwritten=512,
 sendsize=512, countsent=1000
PID: REMOTE TEST FINISHED at DATE
PID: REMOTE TEST FINISHED OK nread=512, countread=1000
```

where:

|           |                                                                                                                                   |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------|
| PID       | is the process id of the outgoing <b>dkload</b> process (LOCAL) or the process id of the incoming <b>dkload</b> process (REMOTE). |
| DATE      | is the current date and time.                                                                                                     |
| nwritten  | is the return code from the final <b>write</b> in the host interface documentation system call.                                   |
| sendsize  | is the number of bytes sent for each iteration.                                                                                   |
| countsent | is the number of iterations actually sent.                                                                                        |
| nread     | is the return code from the final <b>read</b> in the host interface system call.                                                  |
| countread | is the number of iterations actually received.                                                                                    |

The values of **countsent** and **countread** should be equal to the number specified on the **/opt/dk/bin/dkload** command line for the **-n** flag. Any other form of entry indicates a failure.

5. In case of a failure:
  - Examine the **dkload** load log (*/tmp/dklog* in the command line shown previously) for an indication of the reason for the failure. See **dkload** in your host interface documentation for a description of the error encountered.
  - See your host interface documentation for troubleshooting procedures.
  - Finally, remove the log file */tmp/dklog*.



---

## Commands Summary

# F

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The following tables summarize *StarKeeper* II NMS commands and node commands available to users. For a detailed description of each command, run **help** <command>.

### ***StarKeeper* II NMS Commands**

---

| Command             | Description                                                        |
|---------------------|--------------------------------------------------------------------|
| <b>alarm_ui</b>     | forms interface for alarm conditioning                             |
| <b>alarmhistory</b> | accesses alarm database                                            |
| <b>alarms</b>       | provides continuous access to alarms                               |
| <b>alarmstatus</b>  | displays an alarm status for a specified network address           |
| <b>backupSKsys</b>  | creates a bootable system backup of the primary root disk          |
| <b>billing</b>      | sets billing control values                                        |
| <b>bridge_aid</b>   | prepares for administering a bridge                                |
| <b>cf</b>           | forms interface for configuration commands                         |
| <b>cfbdt</b>        | forms interface for Billing Day/Year Tables configuration commands |
| <b>cfchange</b>     | modifies network element entries                                   |
| <b>cfdelete</b>     | removes entries for network elements                               |
| <b>cfenter</b>      | makes new network element entries                                  |
| <b>cfgload</b>      | loads/synchronization with database                                |
| <b>cfg_sync</b>     | synchronizes the configuration data for nodes                      |
| <b>cfscript</b>     | performs synchronization with database add/delete files            |
| <b>cfverify</b>     | displays network element entries                                   |
| <b>chg_link</b>     | changes primary and alternate link                                 |
| <b>clear</b>        | clears outstanding alarm                                           |
| <b>conn_sync</b>    | updates local network-wide node connections                        |
| <b>connections</b>  | displays node connections status                                   |
| <b>console</b>      | connects and disconnects to M port or B port                       |
| <b>Display</b>      | displays software versions and software licensing                  |

| Command              | Description                                                                            |
|----------------------|----------------------------------------------------------------------------------------|
| <b>ici_disp_mods</b> | displays ICI node modules performing configuration updates                             |
| <b>ici_dl</b>        | downloads ICI configuration data to all ICI nodes in the network                       |
| <b>ici_primary</b>   | sets/unsets a <i>StarKeeper</i> II NMS Core System as primary in an ICI network        |
| <b>netdisp</b>       | receives alarm lists                                                                   |
| <b>noalarms</b>      | turns off continuous access to alarms                                                  |
| <b>nping</b>         | sends a ping on any Frame Relay PVC in the network to measure network round trip delay |
| <b>pi</b>            | accesses Programmer's Interface                                                        |
| <b>rem_rpt</b>       | removes restored report data                                                           |
| <b>report</b>        | requests <i>StarKeeper</i> II NMS report                                               |
| <b>res_rpt</b>       | restores archived data                                                                 |
| <b>sequence</b>      | sets up dialog with node                                                               |
| <b>setnode</b>       | directs subsequent commands to specified node                                          |
| <b>skbackup</b>      | <i>StarKeeper</i> II NMS database backup utility                                       |
| <b>sk_license</b>    | licenses software so it can be functional                                              |
| <b>skload</b>        | loads node configuration db into <i>StarKeeper</i> II NMS db                           |
| <b>skrestore</b>     | <i>StarKeeper</i> II NMS database restore utility                                      |
| <b>skschema</b>      | displays <i>StarKeeper</i> II NMS database information                                 |
| <b>SKsh</b>          | <i>StarKeeper</i> II NMS menu interface (see below)                                    |
| <b>sk_sync</b>       | synchronizes configuration database tables                                             |
| <b>smstat</b>        | displays status of Session Maintenance function                                        |
| <b>smverify</b>      | displays Session Maintenance reroute data                                              |
| <b>sni_sync</b>      | sync SNI data                                                                          |
| <b>tmeas</b>         | displays measurement data for high-speed trunk modules                                 |
| <b>tracec</b>        | traces a call to its origin                                                            |

## Help Commands

| Command                  | Description                     |
|--------------------------|---------------------------------|
| <b>help [command]</b>    | detailed description of command |
| <b>help [message id]</b> | detailed description of alarm   |

### **StarKeeper II NMS Menu Interface (SKsh)**

| <b>Command</b>  | <b>Description</b>                                         |
|-----------------|------------------------------------------------------------|
| <b>ALRMADM</b>  | alarm conditioning utilities                               |
| <b>BDTMGMT</b>  | Billing Day/Year Table Management                          |
| <b>CFCOMMAN</b> | configuration commands                                     |
| <b>NDSWMGMT</b> | node software management                                   |
| <b>SYSADM</b>   | general <i>StarKeeper</i> II NMS management utilities menu |
| <b>UPDNLD</b>   | node upload/download                                       |

### **Partitioned User Administration**

| <b>Command</b>     | <b>Description</b>                              |
|--------------------|-------------------------------------------------|
| <b>Custreports</b> | restrict reports                                |
| <b>DefineUser</b>  | define a customer login                         |
| <b>Deny</b>        | deny access to a command                        |
| <b>Permit</b>      | designate a command for a user                  |
| <b>Print</b>       | list a user's commands                          |
| <b>Printall</b>    | list all available commands                     |
| <b>PrntOpt</b>     | define printer configuration                    |
| <b>pr.list</b>     | list a few lines from reports                   |
| <b>pr.remove</b>   | remove specified report                         |
| <b>pr.report</b>   | print report on terminal                        |
| <b>RemoveUser</b>  | remove a customer login                         |
| <b>User</b>        | list the users defined by network administrator |

### **Partitioned User Commands**

| <b>Command</b> | <b>Description</b>                       |
|----------------|------------------------------------------|
| <b>Diagvdm</b> | diagnose a VDM                           |
| <b>Motd</b>    | change node message of the day           |
| <b>Rmres</b>   | <b>remove</b> followed by <b>restore</b> |
| <b>Print</b>   | list the user's commands                 |

## Node Commands

---

### Node Administration

The following node administration commands are available from *StarKeeper II* NMS using the *passthru* feature. For help for these commands enter *dkhelp* while at the node prompt.

| Command                    | Description                                                             |
|----------------------------|-------------------------------------------------------------------------|
| <b>change</b>              | redefine an entity                                                      |
| <b>copy</b>                | copy configuration data                                                 |
| <b>delete</b>              | remove entity definition                                                |
| <b>diagnose</b>            | run diagnostic tests                                                    |
| <b>display</b>             | display status information                                              |
| <b>dkbackup</b>            | copy config data to bkup area                                           |
| <b>dkhelp</b>              | display command help                                                    |
| <b>dkset</b>               | set date and time                                                       |
| <b>dmeas</b>               | display detailed measurements                                           |
| <b>dstat</b>               | display detailed status                                                 |
| <b>enter</b>               | define an entity                                                        |
| <b>exit</b>                | exit system console session                                             |
| <b>getconns</b>            | gathers connection information (FRM module, <i>Datakit II</i> VCS R5.0) |
| <b>initialize</b>          | reset or reboot entity                                                  |
| <b>install</b>             | register software key                                                   |
| <b>move</b>                | move configuration data                                                 |
| <b>remove</b>              | take object out of service                                              |
| <b>restore</b>             | put object back into service                                            |
| <b>retire</b>              | permits retiring critical or major alarms                               |
| <b>retries</b>             | cr and ma audible alarms                                                |
| <b>retrieve</b>            | retrieve archived data                                                  |
| <b>route</b>               | display traffic routes                                                  |
| <b>rptconns</b>            | produces a module report (FRM module, <i>Datakit II</i> VCS R5.0)       |
| <b>schedule</b>            | schedule output of reports                                              |
| <b>smdsmeas/<br/>smeas</b> | displays SMDS measurement reports                                       |
| <b>stop</b>                | halts cc software execution                                             |
| <b>switchover</b>          | switch control computers                                                |
| <b>sync</b>                | sync DK memory with disk                                                |
| <b>utilsh</b>              | access to interactive shell                                             |
| <b>verify</b>              | display static config data                                              |



## MRC Commands

After establishing a connection with the *StarKeeper II* NMS **console** command, the following commands can be entered at the MRC > prompt for a CCM system or at the MRCM > prompt for an ECPU System. For help, enter **help** or **help <command verb>** for example, **help connect**.

| Command             | Command                           |
|---------------------|-----------------------------------|
| connect             | load                              |
| connect 0           |                                   |
| connect 1           | remove standby                    |
| connect active      | restore standby                   |
| connect standby     | retire alarm                      |
| diagnose internal   |                                   |
| diagnose io         | set a <aau, alarm, baud, command> |
| display diagnostic  | set b <aau, alarm, baud, command> |
| display status      | set address                       |
| display time        | set attention                     |
|                     | set m <baud>                      |
| help                | set name                          |
| help <command verb> | set recovery                      |
|                     | set time                          |
| initialize 0        |                                   |
| initialize 1        | switchover                        |
| initialize active   |                                   |
| initialize standby  |                                   |

## Utility Commands

The following node utility commands are available from the node **utilsh** command.

| Command          | Description                                                                                   |
|------------------|-----------------------------------------------------------------------------------------------|
| <b>cp</b>        | copy files to a specified target                                                              |
| <b>dbaudit</b>   | generate a report of database usage                                                           |
| <b>dbupgrd</b>   | convert an existing configured database                                                       |
| <b>dbresize</b>  | change the sizes of the database tables                                                       |
| <b>diskcopy</b>  | copy stored data from one disk area to another                                                |
| <b>diskcpvfy</b> | copy and verify data stored on disks                                                          |
| <b>diskvfy</b>   | verify data stored on disks                                                                   |
| <b>dupdisk</b>   | copy the VTOC, partition 0 and partition 3 from the source disk to the destination disk       |
| <b>exit</b>      | terminate processing                                                                          |
| <b>fsck</b>      | audit and correct data inconsistencies in file systems                                        |
| <b>initload</b>  | load the VTOC and the software from the release tape to the specified destination disk drive. |
| <b>install</b>   | add feature packages to the node software                                                     |
| <b>ls</b>        | list of directory                                                                             |
| <b>mount</b>     | inform the system that a removable file system is on a special device                         |
| <b>mv</b>        | move a file to a specified target                                                             |
| <b>reboot</b>    | reboot the control computer                                                                   |
| <b>rm</b>        | remove a file form the current directory                                                      |
| <b>sync</b>      | flush unwritten system buffers out to disk                                                    |
| <b>umount</b>    | remove the file system which was mounted on a special device                                  |



### NOTES:

*StarKeeper II* NMS does not support the **reboot** and **fsck** commands when the switch of the SCSI/DKI board is in the DIAG position.

When **diskcopy**, **diskcpvfy**, and **diskvfy** utility commands are used from the *StarKeeper II* NMS *passthru* feature, the node displays informational messages, each overwriting the previous line displayed. Through *StarKeeper II* NMS, each message is displayed on a different line, and eventually scroll the terminal screen.

When an unsupported **utilsh** command is entered, the console/terminal will hang for 180 seconds. This terminates the command and returns back to the *passthru* mode, not the *utilsh* mode.

---

## Re-initializing the Database

# G

---

Database initialization is completed during the installation of *StarKeeper II* NMS. If you choose to re-initialize the database after you have installed *StarKeeper II* NMS, use the following procedure.



### WARNING:

*Re-initializing the database destroys any data you currently have stored.*

---

#### Procedure G-1. Re-initializing the Database after *StarKeeper II* NMS Installation

---

1. Log in as cnmsadm and press  .
2. Enter **SKsh** at the SK: prompt and press  .
3. Enter **s** to select SYSADM from the screen and press  .
4. Enter **d** to select DBUTILS from the screen and press  .
5. Select SHUTSK and INITDB from the DBUTILS menu. *StarKeeper II* NMS shuts down, but you are left in the menu system as shown in the following screen.

#### StarKeeper II (R) Network Management System - Selection Menu

| Select  | Description                                  | Menu: dbutils. | Level: 3 |
|---------|----------------------------------------------|----------------|----------|
| INITDB  | Initialize StarKeeper II Database and Tables |                |          |
| RSPACE  | Regain Space From Database Tables            |                |          |
| STARTUP | Startup StarKeeper II                        |                |          |
| SHUTSK  | Shutdown StarKeeper II                       |                |          |

Enter a selection (or ?selection for help) and press RETURN

6. To re-initialize the database, enter **y** in the following screen and press

.

Loading initialization program and checking database status ...

Database      Status

|                      |   |
|----------------------|---|
| Configuration Tables | S |
| Alarm Tables         | S |
| Billing Tables       | S |
| Performance Tables   | S |

S: successful      F: failed

Do you want to re-initialize database or database subsystem(s)? [y, n] :

7. The following screen menu allows you to select a specific subsystem, a group of subsystems, or all subsystems. For a new installation, choose 5) All Above to select all subsystems. Enter **5** and press  .

### INITIALIZE TABLES MENU

- 1) Configuration Tables
- 2) Alarm Tables
- 3) Billing Tables
- 4) Performance Tables
- 5) All Above
- 6) Quit

Please enter selection(s); e.g., 1 or 1,2,3 :

8. The following confirmation messages appear.

Re-initializing configuration tables ... finished.  
Loading static data for configuration tables ... finished.

Re-initializing alarm tables ... finished.  
Loading static data for alarm tables ... finished.

Re-initializing billing tables ... finished.  
Loading static data for billing tables ... finished.

Re-initializing performance tables ... finished.  
Loading static data for performance tables ... finished.

The re-initialization of the database is now complete.

---

## Node and *StarKeeper* II NMS Messages

# H

---

This appendix discusses node and *StarKeeper* II NMS messages, and is used in conjunction with the section titled **Using the Programmer's Interface** in **Chapter 4**. It describes *parsed messages* for node and *StarKeeper* II NMS alarms. Parsed messages consist of fields containing information that can be accessed by the Programmer's Interface application programs you write in a shell script or the C programming language. Each alarm and eventlog message is identified with a number (message identifier) and descriptive text. Message identifiers are required to administer Programmer's Interface application programs. For additional information about alarm or eventlog messages, enter **help** <message id>.

Parsed messages differ from messages described in the node's *Messages Reference* manual in two important ways:

1. The messages are *parsed* by the *StarKeeper* II NMS parser program. Only fields relevant to *StarKeeper* II NMS are contained in parsed messages.
2. The field names for the messages differ from those listed in reports and documentation. In parsed messages, field names consist of a single field, often mnemonic, with underscore characters instead of spaces to separate words.

### Node Messages

Node alarm and status messages notify the network administrator of system, process, or hardware problems and status detected by self-testing software and other monitoring devices. When the node's Control Computer detects a problem, a message is displayed at the console, or printed at the system printer, or it may appear in both places.

If your system is equipped with an Alarm Relay Unit (ARU), an audible alarm signal may be issued in addition to the message output to the console or printer, depending on the severity of the alarm. A sound unique to that particular message severity level is emitted, distinguishable from alarms sounded for other severity levels. The number of times the signal is emitted is determined by the severity

level of the message generating the audible alarm. Once the problem has been investigated and resolved, the audible alarm may be retired.

### Message Types

---

Node alarm and status messages are issued for the Control Computer and the MRC.

MRC alarm and status messages may also appear. In a node with an MRC, the MRC automatically sends these messages to the M port, and to the A and B ports if configured to do so with the node's **set** command. Control Computer failure, standby Control Computer failure, and MRC failure are all reported.

MRC alarm and status messages are divided into the following categories:

|                           |                                                                                                                                                                                                                                                         |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MRC Report Alarm</b>   | indicates hardware failure related to either the active or standby Control Computer. MRC Report Alarm messages are issued in three levels of severity, and are repeated at regular intervals until the problem is resolved and/or the alarm is retired. |
| <b>MRC Report Command</b> | provides information regarding user input of MRC commands. MRC Report Command messages are only displayed on the console and printer and do not contain data regarding problems.                                                                        |
| <b>MRC Report Status</b>  | provides current system status information important to network administration. MRC Report Status messages are only displayed on the console and printer and do not contain data regarding problems.                                                    |

### Message Severity

---

Each message has a severity (or priority of action) determined by its responsibility for flagging a particular range of problems. This severity is defined as follows:

| Severity  |               |
|-----------|---------------|
| Indicator | Level         |
| *C        | critical      |
| **        | major         |
| *         | minor         |
|           | informational |

Each indicator actually has two characters assigned; minor alarms use asterisk and space, informational alarms use two spaces.

**\*C Critical**

A critical severity level indicates that the node is inoperable and requires immediate action to restore network service. No calls are being processed and communication through the node is not possible. Any one of the following conditions results in the generation of a critical alarm:

- more than one active Control Computer
- failure of a critical module (SWITCH, CLOCK, REPEATER, and Control Computer modules)
- software errors
- node failure

A critical alarm chimes twice every two seconds ("ding ding").

If an ARU is not in use, the alarm is sent to the system printer or console.

**\*\* Major**

A major alarm indicates a serious, service-degrading condition. Either of the following conditions can result in the generation of a major alarm:

- interface module failures
- environmental extremes

For example, a major alarm is issued if an interface module fails to send packets because it is faulty or has blown a fuse, or if an environmental failure such as higher room temperature than the recommended range is detected.

A major alarm chimes once every two seconds ("ding").

If an ARU is not in use, the alarm is sent to the system printer or console.

**\* Minor**

A minor alarm indicates a secondary or a transient error that is not likely to affect overall node service unless multiple minor alarms are issued. In this case, a serious condition exists that may affect overall system performance. The following conditions can cause a minor alarm to be generated.

- parity errors
- FIFO overflows

A minor alarm emits a constant, high-frequency tone ("beeeeeeeee . . .") that automatically stops after three seconds.

If an ARU is not in use, the alarm is sent to the system printer or console.

## Informational

The fourth priority of action code is reserved for information. A message without a priority of action symbol indicates a condition that does not adversely affect service.

## Node Message Format

---

The following screen illustrates the format of a typical node alarm or status message.

## Report <Type> <msgid>

---

```
<YY-MM-DD> <hh:mm:ss> NODE=<xxx...x>
* <msgid>: <ENTITY>=<num>
REPORT <TYPE>: <process>: <message text>
Rec act: <text>
```

Where

|                 |                                                                                                                                                                                                                                                                                                               |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <YY-MM-DD>      | is the <i>year, month, date, hour, minute, and second</i> that the message was output.                                                                                                                                                                                                                        |
| <hh:mm:ss>      |                                                                                                                                                                                                                                                                                                               |
| NODE=<xxx...x>  | is the <i>name</i> of the <i>node</i> experiencing trouble or reporting status information.                                                                                                                                                                                                                   |
| *               | is one of four possible <i>priority of action</i> codes.                                                                                                                                                                                                                                                      |
| <message id>:   | is a 4-digit numeric code that <i>uniquely identifies</i> the output message.                                                                                                                                                                                                                                 |
| <ENTITY>=<num>  | is the <i>entity</i> and its <i>address</i> or <i>position</i> , or the part of the node that is experiencing the trouble reported in the message.                                                                                                                                                            |
| REPORT <TYPE>:  | is the string that identifies the <i>type</i> of message output. All messages are prefixed with a <i>report</i> string.                                                                                                                                                                                       |
| <process>:      | is the <i>name</i> of the Control Computer <i>process</i> which generated the message.                                                                                                                                                                                                                        |
| <message text>  | is the main <i>text</i> of the <i>message</i>                                                                                                                                                                                                                                                                 |
| Rec act: <text> | is the <i>text</i> of the <i>recommended action</i> string. This string briefly provides information to correct the problem. It suggests actions which may be taken to restore the system, warns of possible service interruptions, or refers network administration to related documentation for assistance. |



**Node Report Message Fields**

---

The following table lists the message fields, a description of each field, and the reports in which the field occurs.

| <b>Field Name</b> | <b>Description</b>                                                                                                                                                                                      | <b>Report Type in which the Field Appears</b>     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| COMMAND           | This value is always <b>log</b> .                                                                                                                                                                       | All report types.                                 |
| MSG_LOGFILE       | The name of the log file that contains the complete text of the received message.                                                                                                                       | All report types.                                 |
| MSG_POSITION      | The position of the received message within the log file.                                                                                                                                               | All report types.                                 |
| MSG_LINE_COUNT    | The character count of the received message in the log file.                                                                                                                                            | All report types.                                 |
| NODE_ID           | The name of the node that is the source of the message.                                                                                                                                                 | All report types.                                 |
| MSGCATEGORY       | Interprets the two priority of action characters that appear at the beginning of the message header line. The categories are: * <b>C</b> (critical), ** (major), * (minor), two blanks (informational). | All report types.                                 |
| MSGID             | The 4-digit decimal code that identifies each message. A message that cannot be identified issues the decimal code <b>0000</b> as the value associated with the MSGID field.                            | All report types.                                 |
| MESSAGE           | Contains the text of the message.                                                                                                                                                                       | All report types.                                 |
| SYSTEM_TYPE       | Indicates the node type (for example, DKII).                                                                                                                                                            | All report types.                                 |
| EVENTID           | The event ID of the Sessions Maintenance Alarms.                                                                                                                                                        | Possible in all reports.                          |
| MODTYPE           | The type of the device issuing the alarm.                                                                                                                                                               | Possible in all reports.                          |
| CAB               | Cabinet number of the entity causing the alarm.                                                                                                                                                         | Alarm, Sassier, Failure, and Status reports       |
| SHELF             | Number of the shelf that contains the entity causing the alarm.                                                                                                                                         | Alarm report                                      |
| SLOT1             | Slot number in the backbone or concentrator from which the alarm originated.                                                                                                                            | Alarm, Syserr, Failure, Error, and Status reports |
| SLOT2             | Module number in the control unit from which the alarm originated.                                                                                                                                      | Alarm and Status reports                          |
| PORT1             | Port number on a backplane or concentrator module from which the alarm originated.                                                                                                                      | Alarm, Syserr, Failure, Error, and Status reports |
| PORT2             | Port on a control unit from which the alarm originated.                                                                                                                                                 | Alarm and Status reports                          |

| <b>Field Name</b> | <b>Description</b>                                                                                                                                               | <b>Report Type in which the Field Appears</b> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| LCHAN1            | LCHAN1 indicates the logical channel number on the backplane or concentrator from which the alarm originated.                                                    | Alarm, Syserr, Failure, and Status reports    |
| LCHAN2            | LCHAN2 indicates the logical channel number on the control unit from which the alarm originated.                                                                 | Alarm report                                  |
| LINK              | For alarms that originated on a module in a concentrator, the LINK field specifies the slot number of the trunk module that links the node and the concentrator. | Alarm report                                  |
| ACTION            | Provides a recommended recovery procedure.                                                                                                                       | Possible in all reports.                      |
| ERR_CODE          | The error code for the cause of the failure.                                                                                                                     | Syserr and Error reports.                     |
| STATE             | Name of the invalid state.                                                                                                                                       | Error report.                                 |
| COMPONENT         | This can be <b>module</b> , <b>port</b> , <b>cu</b> , or <b>terminal</b> .                                                                                       | Status report                                 |

## ***StarKeeper II NMS Messages***

---

*StarKeeper II* NMS messages appear in a different format than node messages. These messages may also be found in the *StarKeeper II* NMS Event Log. For example, the following message contains an ID number, a message category, a message type, a process name, and text.

**10032 \*\* REPORT CNMSMSG cnms\_mon: Process <name> (<pid>) restarted**

where:

|                                 |                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------|
| <b>0032</b>                     | is the 5-digit message ID number.                                               |
| <b>**</b>                       | is the message category.                                                        |
| <b>REPORT CNMSMSG</b>           | is the message type.                                                            |
| <b>cnms_mon</b>                 | is the name of the <i>StarKeeper II</i> NMS process that generated the message. |
| <b>Process &lt;name&gt; ...</b> | is the text of the output message.                                              |

## ***Common StarKeeper II NMS Message Fields***

---

*StarKeeper II* NMS generates alarms or messages about itself. All *StarKeeper II* NMS alarms and messages include the following fields:

|                    |                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMMAND</b>     | This value is always <b>LOG</b> .                                                                                                                                                                                   |
| <b>SYSTEM_TYPE</b> | This value is always <b>SK</b> .                                                                                                                                                                                    |
| <b>NODE_ID</b>     | This value is always <b>CNMS</b> .                                                                                                                                                                                  |
| <b>MSGCATEGORY</b> | Interprets the two priority of action characters that appear at the beginning of the message header line. The categories are <b>*C</b> (critical), <b>**</b> (major), <b>*</b> (minor), two blanks=(informational). |
| <b>MESSAGE ID</b>  | The 5-digit decimal code that identifies each message.                                                                                                                                                              |
| <b>MESSAGE</b>     | Text of the message.                                                                                                                                                                                                |



---

## Upload/Download Error Messages



---

Error messages that the upload/download process can recognize go to the user's screen. Other error messages, which occur when the process is running in the background, go to the status files. They are accessed through the STATUD and REPUD choices from the Updnl Menu. Refer to **Chapter 3**, the subsection titled **Getting Upload/Download Status Reports**, for instructions.

When messages are sent to status files, they appear with *node identification*, *date*, *time* and *status*; with the word "Failed--" as shown below:

```
NODE: silver
DATE/TIME 03/25/98 08:23:15
STATUS: Failed -- SERVER HUNG UP
```

Upload/Download error messages are generated by the *StarKeeper II* NMS or the node.

### ***StarKeeper II* NMS Upload/Download Error Messages**

---

Listed below, in alphabetical order, are the *StarKeeper II* NMS error messages associated with the Upload/Download process. After each message is a brief description with a recommended course of action.

- abort from the sequence pattern file  
An unexpected message was received from the node. Try again. If you receive this error message again, call your appropriate support group.
- badly formatted connect request  
Reboot *StarKeeper II* NMS and try again.
- cannot compile the pattern file  
A regular expression in the patterns file is incorrect. Internal error. Call your appropriate support group.

- cannot create full node name; check each level of node name  
The node name at the node does not match the node name in the *StarKeeper II* NMS database. Run **skload** or **cfg\_sync** before running upload/download; see **Chapter 6** for instructions.
- cannot format sending fielded buffer  
Internal error. Call your appropriate support group.
- cannot get the login name of the user  
Internal Error. Call your appropriate support group.
- cannot get the value of environment variable HOME  
Internal error. Call your appropriate support group.
- cannot open sfile  
Internal error. Call your appropriate support group.
- cannot open the file to be sent to parse  
Make sure you are logged in as cnmsadm and you are not using superuser (su). Check permissions on the directory and *u*log file; permissions should be 775. It should be readable and writable.
- cannot open the pattern file  
Check the permissions on the pattern files **updn.pat** and **reboot.pat** under the *\$INPUT* directory. They should exist and have read permission.
- command is too long  
The command being sent to 'sender' is too long. Internal error. Call your appropriate support group.
- could not send connect request to doorway  
Either doorway is not running or *StarKeeper II* NMS is down. Run **ps -af** on your machine to see if *StarKeeper II* NMS is running. If *StarKeeper II* NMS is not running, use SKsh to run 'STARTSK' from the SYSADM menu.
- could not send parse request to the parser  
Either the parser is not running or *StarKeeper II* NMS is down. Run **ps -af** on your machine to see if *StarKeeper II* NMS is running. If *StarKeeper II* NMS is not running, use SKsh to run 'STARTSK' from the SYSADM menu.
- door is in the process of disconnecting from this node  
Try again.
- door was unable to send the message to the node  
Try again.
- doorway error in processing connect request  
Try again.

- echo stripping error  
Internal error. Call your appropriate support group.
- environment variable MSG\_QID is undefined  
Internal error. Call your appropriate support group.
- error in init the receiving fielded buffer  
Internal error. Call your appropriate support group.
- error in receiving buffer; make sure SK is running  
Run **ps -af** on your machine to see if *StarKeeper* II NMS is running. If *StarKeeper* II NMS is not running, use SKsh to run 'STARTSK' from the SYSADM menu.
- error in sending buffer; make sure SK is running  
Run **ps -af** on your machine to see if *StarKeeper* II NMS is running. If *StarKeeper* II NMS is not running, use SKsh to run 'STARTSK' from the SYSADM menu.
- invalid node name  
Use **cfverify** to check the spelling of the node name and type in a correct node name or, if the node name does not exist, enter the node name in the database by using **cfenter**.
- invalid port  
Internal error. Call your appropriate support group.
- logger detected an error  
Internal error. Call your appropriate support group.
- logger detected an error and echo strip error  
Internal error. Call your appropriate support group.
- more than <nnnn> pages of output  
Too much data on the node. Call your appropriate support group.
- neither CSE\_FIRST nor CSE\_MORE nor CSE\_CLEAN  
Internal error. Call your appropriate support group.
- no more pages available  
No data was returned from the node. Try again.
- node does not know the SK service address  
The service address (**uname**) is not correctly defined on the *StarKeeper* II NMS Connection Class Details Form. Make sure the service address and the group security pattern **?dwnld** is defined correctly on the nodes.
- node is busy; try again

- Self-explanatory. Try again.
- node name is not unique  
Use full node name.
  - NULL command pointer  
No command was specified to be sent to the node. Internal error. Call your appropriate support group.
  - received 'Timeout on Input' from node  
Internal error. Call your appropriate support group.
  - StarKeeper is not monitoring the node at this time  
The node is inactive. Make the node active by using **cfchange**.
  - timeout CNMS\_send to doorway queue  
Run **ps -af** on your machine to see if *StarKeeper* II NMS is running. If *StarKeeper* II NMS is not running, use SKsh to run 'STARTSK' from the SYSADM menu.
  - timeout CNMS\_send to parse queue  
Run **ps -af** on your machine to see if *StarKeeper* II NMS is running. If *StarKeeper* II NMS is not running, use SKsh to run 'STARTSK' from the SYSADM menu.
  - timeout on the doorway  
Try again. If you get the same message, call your appropriate support group.
  - timeout on the parser  
Try again. If you get the same message, call your appropriate support group.
  - too many patterns in the pattern file  
Check to see if the pattern files **updn.pat** and **reboot.pat** exist under the *\$INPUT* directory. If they do not, call your appropriate support group.
  - unexpected prompt from node  
Internal error. Call your appropriate support group.



## Node Upload/Download Error Messages

---

Listed below, in alphabetical order, are the Upload/Download error messages that originate from a node and are sent to the *StarKeeper II* NMS console. After each message is a brief description.

- CAN NOT CREATE/OPEN DOWNLOAD FILE ON CONTROLLER.

The node operating system was unable to execute a command to create and/or open the specified download file. This might indicate a failure in the file system. Perform a file system check.

- COULD NOT CLOSE RAW ARCHIVE FILE.

While attempting to terminate the **download backup** command, the node could not close the raw device found in the */dev* directory. Media failure may have occurred. Schedule maintenance and execute a file system check.

- COULD NOT OPEN RAW ARCHIVE FILE - CHECK PERMISSIONS.

While attempting to execute the **download backup** command, the node could not access the raw device found in the */dev* directory. Check file permissions.

- DOWNLOAD FILE DOES NOT EXIST OR IS UNREADABLE

The user has specified a file name which does not exist in the host computer's file system. Or, the file name exists but the read permissions are turned off. See the **chmod** manual page in the OS manuals for setting permissions.

- DOWNLOAD FILE HAS BAD FORMAT.

The upload/download server on the node and the destination host exchange an internal format record. This error would only be received if the host upload program violated the formatting protocol. This is not possible with the officially supported program.

- ERROR DURING WRITE TO DISK.

The node operating system was unable to execute a command to write data it's receiving during a download to the storage media. Media failure may have occurred.

- HOST FILE DOES NOT EXIST.

The user has specified a file name which does not exist on the destination host server.

- NEVER RECEIVED ACKNOWLEDGMENT TO DATA.

The node operating system was unable to successfully transmit/receive a data message to/from the destination host. High error rates on a transmission facility could cause this error.

■ RECEIVED A BAD COMMAND FROM THE HOST.

The node was expecting an acknowledgment to an upload/download request, and instead received an unknown command type. This indicates an incompatible version of the upload/download program on the destination host.

■ SERVER BUSY TOO LONG

The node upload/download server tries for 1 minute to establish a circuit for the upload/download to take place. The interface connecting the destination host server to the network may be out of channels.

■ SERVER FAILED TO ACKNOWLEDGE

The destination host acting as the upload/download server has failed to respond to the node's upload/download request.

■ SERVER HUNG UP

The destination host acting as the upload/download server has initiated a call takedown through the network. Verify the /etc/dksrvtab entry for the upload/download service on the host, and verify the proper installation of the upload program in the host's file system.

■ SERVER NOT ANSWERING

The requested server name is not in service. No interface hardware is assigned to the requested name. The interface hardware assigned to the requested name is not in service or is not operational. The remote server may not answer for reasons of its own.

■ SYSTEM CALL FAILED, CANNOT ALLOCATE A CHANNEL.

The node operating system has failed to execute a command necessary for establishing communication between the two endpoints involved in the upload/download. Indicates a critical failure has occurred on the node.

■ SYSTEM CALL FAILED, CANNOT OPEN DATA CHANNEL.

The node operating system has failed to execute a command necessary for establishing communication between the two endpoints involved in the upload/download. Indicates a critical failure has occurred on the node.

■ SYSTEM CALL FAILED, DIAL STRING NOT COMPLETE.

The node operating system has failed to execute a command necessary for interprocess communication. Indicates a critical failure has occurred on the node.

■ SYSTEM CALL FAILED DURING DATA TRANSMISSION.

The node operating system was unable to maintain data link communication with the destination host while transmitting the specified upload file(s).

- **SYSTEM CALL FAILED DURING INITIALIZATION.**

The node operating system was unable to establish data link communication with the destination host while attempting to transmit the upload header message.

- **SYSTEM CALL FAILED DURING TERMINATION.**

The node operating system was unable to maintain data link communication with the destination host while transmitting to the upload trailer message.

- **TIMEOUT ON REQUEST FOR DOWNLOAD OR UPLOAD.**

The destination upload/download server's response has not reached the node within 15 seconds. Either the server is experiencing severe processing delays, or high error rates on a transmission facility exceed acceptable limits.

- **UNKNOWN PROBLEM ON THE HOST SERVER.**

Communication has been successfully established between the node and destination host server, but the host has indicated that it cannot perform a download at this time.

- **UPLOAD FILE CANNOT BE CREATED ON HOST.**

The destination host's upload root file system is out of space.

- **UPLOAD FILE DOES NOT EXIST.**

The user has specified a file name which does not exist on the node.



---

## SCP Error Codes

# J

---

The following is a list of error codes that you may see when you are looking through the *StarKeeper II* NMS Event Logs (\$EVENTLOG). They are referred to as "SCP" error codes in the event log messages where SCP is the acronym for "Seamless Communication Platform." SCP is the internal mechanism that supports the distributed architecture in *StarKeeper II* NMS.

These error codes may be encountered during file transfers between *StarKeeper II* NMS applications such as the database server process and the focus data gatherer process. These are possible errors that may be returned by the CommKit HIS during file transfer operations. In general, when these errors are encountered, *StarKeeper II* NMS applications would take the appropriate actions based on the error codes received.

The SCP error codes and their descriptions are included in Table J-1 to aid the administrator in understanding the event log messages; they are also included here to aid any subsequent trouble-shooting activities of problems that may be related to these errors.

**Table J-1. SCP Error Codes in Event Logs**

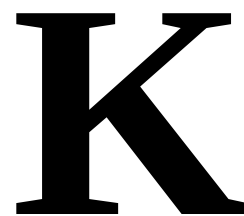
| SCP Error      | Error Code | Description                             |
|----------------|------------|-----------------------------------------|
| EX_USAGE       | 64         | command line usage error                |
| EX_DATAERR     | 65         | data format error                       |
| EX_NOINPUT     | 66         | cannot open input file                  |
| EX_NOUSER      | 67         | addressee unknown                       |
| EX_NOHOST      | 68         | host name unknown                       |
| EX_UNAVAILABLE | 69         | service unavailable                     |
| EX_SOFTWARE    | 70         | internal software error                 |
| EX_OSERR       | 71         | system error (for example, cannot fork) |
| EX_OSFILE      | 72         | critical OS file missing                |
| EX_CANTCREAT   | 73         | can not create output file              |
| EX_IOERR       | 74         | input/output error                      |

**Table J-1. SCP Error Codes in Event Logs —Continued**

| SCP Error       | Error Code | Description                                  |
|-----------------|------------|----------------------------------------------|
| EX_TEMPFAIL     | 75         | temporary failure; user is invited to retry  |
| EX_PROTOCOL     | 76         | remote error in protocol                     |
| EX_NOPERM       | 77         | permission denied                            |
| EX_HBUSY        | 78         | all channels busy                            |
| EX_TOSRV        | 79         | remote node not answering                    |
| EX_HOSRV        | 80         | server not answering                         |
| EX_TBUSY        | 81         | all trunk channels busy                      |
| SCP_ESYSERROR   | 401        | UNIX System error, examine errno             |
| SCP_ENOEXIST    | 402        | for all SCP_CTL function calls               |
| SCP_ENOTFULL    | 403        | specified path is not a full path name       |
| SCP_ESH         | 404        | system(3) call's not RC not 0                |
| SCP_EBADENV     | 405        | environment variable not found               |
| SCP_EBADTAG     | 406        | bad session id                               |
| SCP_EQ          | 407        | trouble with Queues                          |
| SCP_EALLOC      | 408        | could not allocate memory                    |
| SCP_EMEM        | 409        | trouble with shared memory                   |
| SCP_ECOMPAT     | 410        | compatibility problem with pre-R3.0 code     |
| SCP_EBADARG     | 411        | bad argument to routine                      |
| SCP_EBADMACH    | 412        | trouble with machine table                   |
| SCP_ETOOLONG    | 413        | argument too long                            |
| SCP_EFMLERR     | 414        | FML error, examine Ferror                    |
| SCP_EMINIT      | 415        | called SCP init more than once               |
| SCP_ENINIT      | 416        | SCP init not called                          |
| SCP_EFILE       | 417        | trouble with a file                          |
| SCP_EXQ         | 418        | trouble with expandable queues               |
| SCP_ELINT       | 419        | place holder for lint                        |
| SCP_EBADFENV    | 420        | file environment variable not found          |
| SCP_EBADSRVC    | 421        | service specified is not valid               |
| SCP_ENOENT      | 422        | no entry exists in the table                 |
| SCP_EINVAL      | 423        | invalid combination of argument values       |
| SCP_ENOTUNIQUE  | 424        | partial node name is not unique              |
| SCP_EBADFLAG    | 425        | global flag value has invalid value          |
| SCP_ENOCNCLASS  | 426        | specified connection class does not exist    |
| SCP_EBADVERSION | 427        | invalid StarKeeper II NMS version or release |

---

## Special Considerations for Customers with Large Frame Relay Performance Databases



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Managing large numbers of Frame Relay entities (PVCs, DLCIs, or ports) can challenge the resources of a *StarKeeper II* NMS Core System machine. In general, the more PVCs that you want to support on a single *StarKeeper II* NMS Core System, the longer it takes to collect and to store the performance data, to summarize the data, and to determine whether the thresholds set have been exceeded. *StarKeeper II* NMS Core System processes are sensitive to the volume of data.

When working with performance measurements, you need to determine what type of data is important and what you want to do with the data.

### **Performance Data Collection**

---

For Frame Relay entities, performance data is collected at regular intervals. For each module, port, virtual port (for FRM-M2 modules) and DLCI, records are collected and stored every 15 minutes. Throughout a day, 96 records are stored for each entity. The database can grow quickly; and as it grows, processing time for various activities increases. Since the number of records stored per day is close to 100 times the number of those specific entities, a configuration containing 30 FRM-M2 modules, 180 physical ports, 2,000 virtual ports, and 10,000 DLCIs requires storing approximately 1.2 million records daily. This configuration example illustrates the data explosion that occurs in response to the number of entities supported by a Core System.

### **Performance Data Post-processing Features**

---

In addition to data collection, the post-processing of performance data consumes machine resources. *StarKeeper II* NMS features are activated in the middle of the night to post-process performance measurements data. These features include handling threshold requests, summarizing data into weekly and monthly views, and deleting records according to specific data retention values.

---

## Thresholding

---

The threshold evaluation process, which is the first process that runs each night, finds all database records that exceed the threshold criteria specified in Performance Reporter. For Frame Relay, the specification of threshold values for many fields is supported. For each field specified, the threshold evaluation process examines the data in the corresponding database table and finds any record that exceeds the defined threshold value. It populates the exception table with information about that record. The combination of large database tables and many threshold fields set increases the time needed to run the threshold evaluation process; therefore, turn thresholding on only for fields that must be reported. By default, all Frame Relay exception fields are set to "N"; meaning threshold values are not evaluated.

## Summarization

---

After thresholding is completed, the performance summarization process begins. The performance summarization process goes through each of the previous day's daily tables and summarizes the information from that daily record into its corresponding weekly and monthly table. Those fields in the weekly and monthly table prefixed by a *t\_* are totals; meaning, the daily data record is added to the existing weekly and monthly record for that field. The fields preceded with a *p\_* are peaks. The performance summarization process processes these peak values by comparing field values in the daily table to those in the weekly and monthly tables and storing the maximum of the two corresponding fields in the weekly and monthly tables. The summarization of Frame Relay data, which is discussed later under RETNMGMT can be turned off to save CPU resources and disk space.

## Data Deletion

---

The cleanup process deletes records from the daily, weekly, and monthly tables that exceed the retention times specified via RETNMGMT.

## Post-Processing Guidelines

---

Nightly post-processing activities begin at 12:30 A.M. Ideally, all post-processing should be completed within 5 to 6 hours to ensure that normal workday activities are not affected.

As the number of entities in the network grows, so does the time required to complete post-processing activities. To estimate how long it takes to perform these activities on a machine, check the times from the previous night. Within the \$DATAFILES directory, the files *thresh\_col.night*, *p\_summary.night*, and *clean.night* contain starting and ending times for threshold, summarization, and data deletion activities.



---

Lucent Technologies performed studies to determine how much data can be post-processed within an acceptable period of time. The system used in and the procedures followed for the study are as follows:

- HP 715/100 Core System
- Measurements were collected 24 hours a day from FRM and FRM-M2 modules. Measurements were not collected for any other module types during this time.
- Daily, weekly, and monthly retention values were set to 2 days, 3 weeks, and 3 months, respectively.
- Summarization was performed on all tables.
- Thresholding was enabled from a Graphics System for all FRM-M2 fields.
- Thresholding was enabled from the same Graphics System for all FRM fields.

As a rough guideline, data for up to 2000 ports (or virtual ports for FRM-M2) and 10,000 DLCIs can be collected and post-processed within 5 to 6 hours. These results were based on many factors present on the Lucent test system, which might differ from those on other systems. Once again, these numbers are rough guidelines; use the Configurator Tool to determine the capabilities and limitations of the specific Core System.

As the number of entities in the network grows beyond the guidelines stated, implement the methods described in the section "Tools to Manage Data Growth" to decrease the post-processing time for the database.

### **Trade-offs Between Collecting and Post-Processing FRM-M2 Performance Data**

*StarKeeper II* NMS can collect significantly more FRM-M2 data than it can post-process. For example, a system can collect performance data for 30,000 DLCIs assuming all are associated with FRM-M2 modules (not FRMs), and thresholding and summarization are turned off. Disabling these features is discussed in the following section.

---

## Tools to Manage Data Growth

---

*StarKeeper II* NMS provides several tools to help prevent under-engineering and over-loading the system. Among them are the following:

1. The Configurator Tool
2. MEASMGMT
3. RETNMGMT
4. Thresholding Administration
5. Off-loading data

### The Configurator Tool

---

Configurator Tool, a PC-based tool, should be run to ensure that the system has enough memory and disk space, and that typical CPU usage is reasonable. If Configurator Tool reports that an insufficient number of resources exist on the host system for your task application, consider adding more memory, getting bigger disks, upgrading to a faster CPU, or getting another host (taking advantage of the *StarKeeper II* NMS distributed architecture feature). Based on what Configurator Tool reports, even a high-end HP system (maximal disks and memory) may not suffice. In such a case, a single host could not process the quantity of data to be collected and stored on that machine. At this point, examine some of the following approaches to alleviate the problems or consider getting another host machine. The Configurator Tool is described in detail in the *StarKeeper II NMS Planning Guide*.

### MEASMGMT

---

The measurements management feature of PERFMGMT in SKsh lets you decide whether to collect performance measurements data for a given node for given module types. Turn off collection if FRM or FRM-M2 data is not needed to save node resources, including data collection time and disk space.

### RETNMGMT

---

The retention management feature of PERFMGMT in SKsh lets you define how many days of daily data, weeks of weekly summarized data, and months of monthly summarized data are to be retained in the database. These numbers help determine whether the system can provide the capabilities you want. As the database grows with the amount of data retained, summarization and threshold evaluation times can grow to where the processes do not complete within a reasonable time, and thus data loss can result.

---

Because the CPU is being used for processing large volumes of data, significantly fewer CPU cycles are available for handling alarms that might be generated, collecting newer performance data, and other critical tasks. Therefore, carefully evaluate how much data must be retained and weigh that against the purpose of the data retention.

Plan performance measurement data retention values carefully. If you off-load data for post-processing elsewhere (see the following), extract the data before it is cleaned up.

## **Summarization Management**

The RETNMGMT feature also provides a means to control the volume of data on the Core System by allowing the summarization of performance data to be disabled for FRM and FRM-M2 modules. This disabling feature can be useful when you want to trade retention of daily data for summarizing that data into weekly and monthly views. By specifying that you do not want to summarize FRM and FRM-M2 performance measurements data, summarization is not performed on FRM and FRM-M2 tables. In addition, all weekly and monthly FRM and FRM-M2 data is deleted, so you can reclaim disk space and reduce processor use during late night post-processing.

## **Threshold Administration**

---

Within *StarKeeper II* NMS Performance Reporter, you can administer specific fields to which you want to apply thresholding. For FRMs and FRM-M2s, most database fields can be administered for thresholding. The more fields to be evaluated daily, the longer the threshold evaluation process and the more burden placed on system resources. By determining exactly which fields are important, you can reduce the time needed to process thresholding evaluations and that could help performance data post-processing activities. Also, turn on thresholding from one Graphics System only. The threshold evaluation process processes the data sequentially on a per-Graphics System basis. So, if it takes one hour to complete the threshold collection process for one Graphics System, it will take two hours for two Graphics Systems assuming the same threshold profile. Although the threshold fields are selected in Performance Reporter, the processing is performed on the Core System.

## **Off-loading Data**

---

If the volume of data becomes so large that normal post-processing of collected performance measurements can no longer occur in a reasonable amount of time, you can unload the data from the Informix database tables and transport the information to another processor where several other processing options exist. Use the **skschema** command to determine the database information to be off-loaded. This command provides information about the database tables and the fields within each table.

---

## Mirror Core System

When off-loading data, one option is to unload the data and transport it to a Core System that is configured to be a mirror image of the Core System from which it came; then that data can be loaded into the target Informix database. This option lets you enable summarization and frees you from being concerned about processing completion time. The standard *StarKeeper* II NMS Core System summarization, thresholding, and reporting capabilities could be available without burdening the Core System that collects and stores the data that comes from the nodes.

## Independent Informix Database

When off-loading data, another option is to unload the data, transport it to another host, load it into an independent Informix database or an alternate database system, and use the tools that come with that system to manipulate and report on the data.

## Import to Excel on a PC

When off-loading data, a third option is to import the unloaded data into a PC spread sheet (Microsoft Excel) and use the features of that product to provide different views of the data. These products have record limits that are significantly smaller than those of a standard database system, like Informix, but you can restrict the volume of data to be unloaded and then imported.

## Off-loading Scenarios

---

The basic approach to off-loading data from your performance database is the same, regardless of the nature of the desired data. It can be described in the following high-level steps:

1. Locate the data.
2. Make sure you have space enough to do the off-loading.
3. Execute the appropriate ISQL statement, examples of which are given below.
4. Transport the data to its destination host.
5. Load the data.
6. Manipulate the data as required.

---

## Network File System

HP's Network File System (NFS) services can help transport data between two HP hosts. Using NFS, you can transfer the data from the Informix database on the Core System directly to another HP host machine. This option eliminates needing the required disk space on the Core System from which the data is being unloaded. For more information on NFS, see HP's *Installing and Administering NFS Services*.

## SELECT Statement Examples

The ISQL statement to select the needed data can be simple (*give me everything*) or complex (*give me a few fields in a few tables corresponding to specific intervals and dates*). Users interested in exploring the capabilities of ISQL can take courses in that language. To guide you in doing some typical scenarios, some specific ISQL statements follow.

Having enough available space to do the unload is essential. If a typical two disk configuration does not provide that additional space, consider an external hard disk. In addition, the complexity of the query and the amount of data in the table will determine how long the query will take to run.

NOTE: The Informix **unload** command does not delete the data from the database.

### Blanket Select

In the first select example, a full set of steps leading through the process is provided. Those additional steps are not repeated in the subsequent examples, because they are similar to what is presented here.

This example selects all the data from the *frm\_dlci* table.

1. Login to the Core System with the login *cnmsadm*.
2. Make sure you have enough free space in a file system where *cnmsadm* can write, for example, in */tmp*. (You cannot know in advance how much free space you will need for any given file you want to unload.)

However, if not enough space exists, you will receive a message explaining that the write failed; meaning, you must remove the file you were writing and find more space in that file system, or select another file system before rerunning the command.

3. To unload the entire *frm\_dlci* table into the flat file **frm\_dlci.unl** in the */tmp* directory, enter this command followed by a carriage return:

```
echo "unload to /tmp/frm_dlci.unl select * from frm_dlci;" | isql sk
```

4. The file **/tmp/frm\_dlci.unl** can now be moved to another machine by whatever method you choose to use.

---

Frame Relay performance measurements data tables use a reference number, *node\_id*, to index node names. To view the relationship of *node\_id* to node name, execute the following command and refer to the results for further interpretation of the off-loaded data:

```
echo "select node_id,node from node;"|isql sk
```

To save this information in a file, execute this command:

```
echo "unload to /tmp/node_names select node_id,node from node;"|isql sk
```

To select all data from the *frm\_dlc* table for a particular node whose *node\_id* is known, say *node\_id*=10, execute this command:

```
echo "unload to frm_dlc.unl select * from frm_dlc where node_id=10;"|isql sk
```

### Selecting Some Fields for One Interval

In this example, the statement selects only a few fields and extracts only the data for the fourth of four intervals. This last clause is added because most Frame Relay data is cumulative over the four 15-minute intervals within an hour; meaning, the fourth interval contains values reflecting the entire hour, as opposed to values reflecting only that 15-minute interval. The FRM-M1 facilities (*frm\_fac*) and FRM-M2 port (*frm\_m2\_pport*) data is non-cumulative, like the SMDS data; even though data is collected every 15 minutes, each set of counters reflects that specific 15-minute interval only.

In the following example, the fields *node\_id*, *link*, *slot*, *port*, *pdate*, *ptime*, *dlci*, *recv\_bytes*, and *xmit\_bytes* were unloaded from the *frm\_dlc* table into a file in /*tmp* called **filea**. Type the following as if it were just one line, without a carriage return, until the end of the entire command line.

```
echo "unload to /tmp/filea select node_id, link, slot, port, pdate, ptime, dlci, recv_bytes, xmit_bytes from frm_dlc where pinterval=60;" | isql sk
```

### Selecting Some Fields for One Interval for Certain Hours

In this example, the select statement is similar to the previous example, except it selects data corresponding to the hours between 10 a.m. and 6 p.m. for the previous day. This variation illustrates that activity was significant only during a portion of the day. This filtering would reduce 96 records per entity to only 8, because first the number of intervals are restricted from 4 per hour to 1 per hour, and then the number of hours are restricted from 24 to 8. For example: for 10,000 DLCIs, this reduction would take 960,000 records and would provide only 80,000 in return.

---

```
echo "unload to /tmp/filea select node_id, link, slot, port, pdate, ptime, dlci,
recv_bytes, xmit_bytes from frm_dlci where pdate=today-1 and pinterval=60
and ptime >= 10 and ptime <=18;" | isql sk
```

## Shell Script Examples

All of the previous examples can be written as shell scripts.

For example, the following shell script is or the previous example. It also includes another unload statement for the *frm\_m2\_dlci* table.

### **un\_dlci.sh**

This script unloads to files in the directory */tmp* which contains the information stored in the *frm\_dlci* and *frm\_m2\_dlci* performance tables for the previous day between the times 10 a.m. and 6 p.m. (ptime>=10 and ptime <=18). This script should be run each morning. Script usage is the following:

```
un_dlci.sh > data.out
```

```
echo "unload to /tmp/frm_dlci select node_id, link, slot, port, pdate, ptime,
dlci, recv_bytes, \
xmit_bytes from frm_dlci where pdate=today -1 and pinterval=60 and ptime
>= 10 and \
ptime <=18;" | isql sk
```

```
echo "unload to /tmp/frm_m2_dlci select node_id, slot, port, vport, pdate,
ptime, dlci, recv_bytes, \
xmit_bytes from frm_m2_dlci where pdate=today -1 and pinterval=60 and
ptime >= 10 and \
ptime <=18;" | isql sk
```

Each **unload** command should be entered as a single line without a carriage return until the end of the command. However, to aid in readability, an **unload** command can be split into several lines, each ending in a carriage return, assuming each line (except the last) has a "\" prior to the carriage return. This technique enables the system to interpret all the lines as one **unload** command.



#### **NOTE:**

The shell script must be given a name, and it must be executable. It also should be run by *cnmsadm*.





---

## Glossary

The definitions in this section appear in alphabetical order. Cross references in the entries are printed in **bold** type.

### A

**aa***u* *command parameter*. An abbreviation for alarm activator unit.

**absolute pathname**. The pathname used to specify a command or program from the *root* directory.

**access**. To connect with and use a software package or hardware device.

**ACE**. An abbreviation for Automated Cable Expertise (OS).

**ACF**. An abbreviation for Access control field (SMDS) .

**adapter**. 1. An auxiliary device or unit used to extend the operation of another system. 2. An electronic part used to connect two dissimilar parts or machines.

**address**. An identifying name or code for a network element or a service that end users can **access**. Addresses reflect a network hierarchy of four level mnemonic addressing: **network/area/exchange/local service address** or the X.121 scheme of: **DNIC/SR/SA/EPN**.

**administration connection**. A connection in which the transfer of node data to *StarKeeper II* NMS databases using *StarKeeper II* NMS Network Builder, the **skload** and **cfg\_sync** commands, and the Session Maintenance **smverify** and **smstat** commands used to monitor Session Maintenance trunks is permitted.

**AI**. An abbreviation for Alarm indication signal (SMDS) .

**AIM**. An abbreviation for Asynchronous Interface Module (ISN) .

**AIM8**. An abbreviation for Asynchronous Interface Module 8-port (ISN) .

**alarms connection**. A connection type in which alarms from external system elements other than BNS-1000, BNS-2000, or *Datakit II* VCS nodes are collected.

**alias**. An alternative (usually shortened) **area** or **exchange** name for a **node**.

**American Standard Code for Information Interchange (ASCII)**. ASCII represents characters, numbers, punctuation marks, or signals in seven on-off bits plus a **parity** bit.

**AMUX**. An abbreviation for Asynchronous Multiplexer.

**anchor**. A method, used in *StarKeeper II* NMS network addressing, to limit the matching criteria when searching for specified records in the database. *Compare wild card*.

**ANSI**. An abbreviation for American National Standards Institute .

**application**. A program that performs a specific task, such as displaying network alarms or running diagnostics.

**area**. Part of the destination code used in addressing; similar to a telephone area code. Each area may include multiple exchanges and each **exchange** may include multiple **local service addresses**.

**ASCII**. An abbreviation for American Standard Code for Information Interchange.

**Async**. An abbreviation for asynchronous communication/protocol. *See Bisync*.

**asynchronous.** Transmission in which the time intervals between data characters can be of unequal length, controlled by start and stop bits at the beginning and end of each character. *Compare synchronous.*

**Asynchronous Interface Module 8-port (AIM8).** An eight-port module for placement in a bridging concentrator.

**Asynchronous Multiplexer (AMUX).** A **concentrator** that provides either 32, 64, or 504 asynchronous ports. *See also Synchronous/Asynchronous Multiplexer.*

## B

**background processing.** The automatic execution of a job, to be run in the background, while the user continues to perform other tasks.

**backplane.** The **bus** in a **node** to which all control and interface modules connect.

**backup.** A spare copy of data or software kept in case the original is damaged or lost.

**bad track.** A part of the hard disk which is not usable.

**billing.** A service that allows the network administrator to track the date and connection time of asynchronous, multiplexed host, synchronous, and X.25 calls through the network on a per-port basis and assign a charge for the service.

**billing connection.** A connection type used to capture billing data. There must be a billing connection to *StarKeeper II* NMS from each node reporting billing data.

**BISYNC.** A Binary Synchronous Communication, link-layered, character oriented IBM protocol used in synchronized transmission of binary coded data.

**BNS-2000.** A cell relay switch that offers connection-oriented service and connectionless, high-speed service using broadband technology.

**board.** A rectangular piece of fiberglass that has pins on one side and electronic parts on the other; also called a card, PC board, or PCB (printed circuit board). The system is always supplied with a system board. Other boards can include a video adapter board, a disk controller board, a network communication board, memory boards, multiplexed host interface boards, and multifunction boards.

**bps.** An abbreviation for bits per second.

**bridge modules.** Interface modules residing in a bridging concentrator.

**BSC3270.** *See SYNC8.*

**buffer.** A temporary storage location for information being sent or received. It is usually located between two different devices that have different abilities concerning speeds for handling the data.

**bus.** The parallel wiring through which bits of data travel to and from the parts of a computer.

## C

**CAC.** An abbreviation for Customer Assistance Center.

**call hold.** A feature that allows a user to have more than one call active at any time.

**call setup.** The **node** activity that establishes a **virtual circuit** connection across the network.

**CCS.** An abbreviation for Customer Control System (*StarKeeper II* NMS).

**central office (CO).** An operating telephone company location where call switching is done.

**central office local area network (CO LAN).** A data communications network switched through a **central office**.

**central processing unit (CPU).** A component of the **control computer**.

**channel.** A transmission path or link.

**CIC.** An abbreviation for Customer Information Center.

**CNM.** An abbreviation for Customer network management (SMDS) .

**CO.** An abbreviation for Central office .

**CO-LAN.** An abbreviation for Central office local area network .

**command partitioning.** A *StarKeeper II* NMS security feature that allows certain users access only to specified commands.

**Computer Port Module-High-speed (CPM-HS).** A multiplexed optical fiber interface.

**Computer Port Module-Multiple Link (CPM-ML).** The CPMML can be located in nodes and Multipurpose Concentrators to provide up to eight wire connections to LAN servers that use a version of *Datakit II* VCS Host Interface Software for multiplexed communications with the network. It supports speeds up to 64 Kbps over RS-232-C or V.35 interfaces.

**concentrator.** A communications device that can connect many devices of differing speeds to the **node**.

**config.** An abbreviation for configuration.

**configuration.** 1. The hardware and software components of a system that determine its capacity and performance. 2. The task of populating databases with information to identify the components with which they communicate.

**connector.** A device allowing the connection of various electrical elements.

**console.** A video display terminal with **key-board** used as an interface to the node or network management system.

**console security.** A password optionally required for administrative access to a node or network management system.

**contention.** A condition where several systems are vying for access to a line and only one can establish a connection. When a connection cannot be established, it is said that this device is lost in contention.

**control computer (CC).** The modules making up node intelligence.

**controller.** *See control computer.*

**Core System.** Core *StarKeeper II* NMS processor. A processor equipped with *StarKeeper II* NMS Core processes. This processor does not contain any graphic system software.

**Co-resident System.** A *StarKeeper II* NMS processor equipped with *StarKeeper II* NMS Core and Graphics processes.

**CPE.** An abbreviation for Customer premises equipment.

**CPM.** An abbreviation for Computer Port Module.

**CPM-HS.** An abbreviation for Computer Port Module-High Speed.

**CPMML.** An abbreviation for Computer Port Module Multiple Link

**CPU.** An abbreviation for Central processing unit.

**CRC.** An abbreviation for Cyclic redundancy check.

**cron.** An abbreviation for chronological.

**critical modules.** The Clock, Eswitch/ Switch, and Repeater modules; if these modules fail, the **node** fails.

**crons.** *StarKeeper* II NMS processes that run automatically at specified times, usually to clean up old files. *Cron* is an abbreviated form of the word *chronological*.

**crontab.** A *StarKeeper* II NMS criteria listing that allows crons to be automatically run at specified times. *Crontab* is an abbreviated form of the words *chronological table*.

**cursor.** 1. In computer graphics, a movable marker used to indicate position on a display. 2. A displayed symbol that acts as a marker to help the user locate a point in text, in a system command, or in storage. 3. A movable spot of light on the screen of a display device, usually indicating where the next character is to be entered, replaced, or deleted.

**Cut-Through Application.** A Graphics System application that allows simultaneous access to several different computers from a single workstation. Direct access to a host by way of a terminal emulation program in *StarKeeper* II NMS.

**Cyclic Redundancy Check (CRC).** A common method of establishing that data was correctly received in data communications. A check performed on data to determine if an error has occurred in the transmitting, reading, or writing of the data.

## D

**database.** A collection of data that can be immediately accessed and operated upon by a data processing system for a specific purpose.

**database conversion.** Upgrading a machine running a previous release of

*StarKeeper* II NMS to the latest release of *StarKeeper* II NMS.

**Datakit Applications Processor (DKAP).** A programmable module for customized applications.

**Datakit II VCS Host Interface Software.** Multiplexed host software that enables a host connection to the node's Computer Port Module (CPM).

**Datakit II Virtual Circuit Switch (VCS).** A multiple feature data switch that provides high-speed data communication between different networks and various computer equipment. The switch can connect **local area networks** to **wide area networks**, and can be used in a single building or an environment with multiple buildings such as a college campus; it can also connect multiple campuses or businesses nationwide. Each *Datakit* II VCS switch is called a **node**.

**DCE.** An abbreviation for Data Communication Equipment. Usually a **modem**.

**DDS.** An abbreviation for Digital Data System (ACCUNET® DATAPHONE® Data Service).

**diagnostic.** Pertaining to the detection and isolation of a malfunction or mistake.

**Digital Data Service (DDS).** A digital transmission carrier service.

**direct connection.** A connection in which a *StarKeeper* II NMS host computer is cabled directly to a remote element with RS-232-C (port B on a BNS-1000, BNS-2000, or *Datakit* II VCS node).

**Disk Cleaner Administration Application.** A feature that allows a Workstation Administrator to monitor disk storage space and remove directories/files.

**disk crash.** A malfunction that may result in loss of data or an inoperable system due to unreadable sectors.

**DKAP.** An abbreviation for *Datakit* Applications Processor.

**DLCI.** An abbreviation for Data link connection identifier (frame relay) .

**DN.** An abbreviation for Distinguished name (SMDS); Data Networking.

**DNIC.** An abbreviation for Data Network Identification Code as used in **X.121** addressing.

**download.** From the viewpoint of the reference computer or node, the act of receiving data from another computer. Choosing the *download* option in some communications programs automatically erases a file of the same name that was meant for transmission. *See* **upload**.

**DTE.** An abbreviation for Data Terminating Equipment. Usually a terminal or computer.

**DTF.** An abbreviation for Digital transmission facility (DS1/DS3) .

**DXI.** An abbreviation for Data Exchange Interface (SMDS) .

**DXI/SNI.** An abbreviation for Data Exchange Interface/Subscriber Network Interface (SMDS) .

## E

**EBIM.** An abbreviation for Ethernet Bridge Interface Module.

**EGA.** An abbreviation for Enhanced graphics adapter.

**EISA.** An abbreviation for Extended Industry Standard Architecture.

**Element Management System (EMS).** A system designed to manage a specific element or group of elements in a network, other than BNS-1000, BNS-2000, or *Datakit* II VCS nodes. An EMS sends alarms to a user's workstation that is log-

ically connected to *StarKeeper* II NMS via the Uniform Alarm Interface (UAI).

**EMS.** An abbreviation for Element Management System.

**end user.** Designates a terminal user in the network or, the user who is operating one of the optional graphics-based applications.

**envelope.** A 10-bit value containing a data or **control byte**, a control bit, and a parity bit.

**EPN.** An abbreviation for endpoint number, which is part of the **X.121** addressing scheme.

**error message.** A response from a program indicating that a problem has arisen or something unexpected has happened, requiring attention.

**Ethernet Bridge Interface Module (EBIM).** An interface module that supports **LAN bridging** for Ethernet environments.

**exchange.** Part of the node destination code used in the addressing scheme. *See* also **network**, **area**, and **local service address**.

**exit.** To leave the operations of a program or a routine of a program.

## F

**factory default.** Parameters defined and set prior to shipment that may or may not be changed or customized.

**FCC.** An abbreviation for Federal Communications Commission.

**FEP.** An abbreviation for Front-end processor.

**female connector.** A cable connector in which the conducting elements are embedded in recessed sockets designed to receive complementary male parts such as a pin or prong.

**First-in, First-out (FIFO).** A queue that interprets and processes messages, one by one, in the order in which they arrive.

**floppy disk drive.** A device that reads and writes information on a floppy diskette.

**format.** 1. To prepare a new floppy diskette or hard disk for use with the computer. 2. The way data is displayed. Pertains to the way data appears on the screen or on printed copy.

**Frame Relay.** A data service incorporating basic aspects of CCITT's LAPD protocol. It is used as one means of providing LAN interconnect service over packet switching networks.

**Frame Relay Modules (FRM/FRM-M2).** Node modules providing a standard-based multiplexed interface to routers and **gateways** from other frame relay modules on the network. FRM is used in an M1 shelf; FRM-M2 in an M2 shelf.

**FRM or FRM-M2.** Abbreviation for Frame Relay Module (M2 indicates the module used in the M2 shelf).

**front end processor (FEP).** A computer under the control of another, larger computer in a communications network. The FEP performs basic housekeeping operations on data streams as they arrive to be processed by the larger computer.

**function keys.** Numbered keys (F1, F2, etc.) on the side or across the top of a keyboard, programmed to perform specific commands with a single keystroke.

## G

**gateway.** A conceptual or logical network station that serves to interconnect two otherwise incompatible networks, nodes, subnetworks, or devices; performs a protocol-conversion operation across a wide spectrum of communications functions, or layers.

**GB.** An abbreviation for "gigabyte." A gigabyte equals 1000 megabytes.

**Graphics System.** A separate processor that contains graphics capabilities to run application packages.

**Graphics System Platform.** A base software package on which all optional, graphics-based *StarKeeper II* NMS application packages are installed.

**group.** A database component identifying a set of ports or channels that are considered a unit. There are two kinds of groups: local (can include any module except a **trunk**) and **trunk** (can include only trunk modules).

**group name.** An identifying label for a database element consisting of a set of ports.

**GUI.** An abbreviation for Graphical user interface.

## H

**hardcopy.** Printed characters on paper. Any off-line documentation.

**HDLC.** An abbreviation for High Level Data Link Control.

**help.** A *StarKeeper II* NMS interface that provides on-screen assistance. Each application supplies help for its own application functions and elements.

**High Level Data Link Control.** A link-layer, bit-oriented synchronous data communications protocol included in the X.25 packet-switching protocol.

**High-speed Trunk (HS-TRUNK).** A high-speed **trunk** module in the **node** or in a SAM64/504.

**hop.** The logical distance between one node and an adjacent node, at the routing layer.

**hop count.** The number of nodes a call setup attempt traverses.

**host computer.** A computer attached to a network that provides services such as computation, database access, or special programs system languages.

**host connection.** A connection in which a *StarKeeper II* NMS host computer is connected to a node by a fiber optic cable.

**Host Interface Software, *Datakit II* VCS.** Multiplexed host software that enables the host connection to a node's Computer Port Module (CPM).

**HP.** An abbreviation for Hewlett-Packard.

**HP-UX system.** A general-purpose, multi-user, interactive, time-sharing operating system used with your computer.

**HS (High Speed).** See **Trunk-HS**.

**HS-TRK.** An abbreviation for High Speed—Trunk (link) module (in SAM64/504).

**hub node.** The network node to which the *StarKeeper II* NMS host computer is connected.

**hunt group.** The association of a list of receiving devices with a single **service address**.

**Hz.** An abbreviation for Hertz.

## I

**ICI.** An abbreviation for Inter-Carrier Interface.

**ID.** An abbreviation for identification.

**init.** An abbreviation for initialize.

**interactive.** The ability to interact with a computer, or to be in a conversational mode with a computer. Interactive processing is time dependent, since a user is waiting for the computer to ask questions and the user responds to the questions.

**Inter-Carrier Interface (ICI)** The Inter-Carrier Interface is a network-to-network

interface. XA-SMDS and intercompany serving arrangements are available via the ICI. Since the ICI is an open interface, networks can interconnect with other vendors' SMDS networks, provided those networks comply with the proper requirements.

**interface.** The relationship between communicating modules, usually in the same node; between different computers; and also the method of access between a program and an end user.

**interface module.** A printed-circuit board providing network access for a specific type of end device.

**interrupt.** A suspension of a process, such as the execution of a computer program, caused by an event external to that process and performed in such a way that the process can be resumed.

**ISDN.** *CCITT Recommendation*. An abbreviation for Integrated Services Digital Network.

## J

**jumper block.** An electrical connector designed to form a connection, or jumper, between corresponding pins on a **jumper strip**.

**jumper strip.** A component on a printed circuit board that contains pairs of pins that can receive **jumper blocks** to set hardware options for the board.

## K

**KB.** An abbreviation for kilobytes.

**Kbps.** An abbreviation for Kilobits per second.

**keyboard.** Commonly used input device.

## L

**LAN.** An abbreviation for Local area network.

**LCS.** An abbreviation for LAN Communication System(s).

**legend.** A set of symbols a user selects and places on network maps to represent network equipment.

**LIM.** An abbreviation for Link Interface Module.

**link interface module (LIM).** A **trunk** module (SFT or SWT) that connects **concentrators** to the node.

**listener address.** The address recognized by a *StarKeeper II* NMS Core System's listener process. This address must be entered into the database of the node(s) that provides *Datakit II* VCS Host Interface Access to the Core System.

**local area network (LAN).** A data network with communicating devices and connection media that occupy a single geographic location.

**local listener address.** The address that the listener process on the local machine responds to when a remote *StarKeeper II* NMS attempts to establish a connection to the local machine. The local listener address must be fully qualified and entered as a service address in the *Datakit II* VCS node that provides network connectivity to the local machine.

**local machine ID.** An integer between 1 and 100, inclusive, and unique among other *StarKeeper II* NMS machines within the *StarKeeper II* NMS network. The assignment of the local machine ID must be made with consideration of the machine IDs assigned to the other *StarKeeper II* NMS machines that comprise the network.

**local service address.** Part of the *Datakit II* VCS (R2.0 and later) addressing scheme that refers to endpoints or a host on a network that receive calls. *See* **addressing**. *Also see* **network**, **area**, and **exchange**.

**LPM.** An abbreviation for LAN Protocol Module.

## M

**MAC protocol.** An abbreviation for Media Access Control (IEEE 802); Master Alarm Collector (*StarKeeper II* NMS).

**machine.** A generic term for a computer or workstation.

**machine ID.** *See* **local machine ID**.

**Maintenance and Redundancy Control (MRC) Module.** For a BNS-2000 or BNS-2000 VCS CCM system, an (optional) intelligent module that monitors the operational state of the control computers in a node; a multiport administrative interface that gives enhanced maintenance and automatic recovery capabilities to a node.

**Maintenance and Redundancy Control Module (MRCM).** For a BNS-2000 or BNS-2000 VCS ECPU system, an (optional) intelligent module that monitors the operational state of the control computers in a node; a multiport administrative interface that gives enhanced maintenance and automatic recovery capabilities to a node.

**male connector.** A cable connector in which the connections are made with pins or prongs that fit into complementary receptacles in a **female connector**.

**Master Alarm Collector (MAC).** A *StarKeeper II* NMS configured to receive and collect alarm messages from other network and element management systems.

**MB.** An abbreviation for megabyte(s).

**Mbps.** An abbreviation for megabits per second.

**message of the day.** A node feature that allows the network administrator to send



up to three lines of text to terminal users when they connect to the network.

**meta-characters.** Special keyboard characters used in *StarKeeper II* NMS for searches (patterns matching) and substitutions.

**message units.** Can be either **packets** or **segments**; depends on the type of node from which this data was collected.

**modem (modulator-demodulator).** A device pair that allows a terminal user to communicate with network services over telephone lines.

**M1.** Series M1 shelf (BNS-2000).

**monitor.** 1. A device for visual presentation of information as temporary images. A video display. 2. *Syn:* cathode ray tube display.

**MPC.** An abbreviation for **Multipurpose Concentrator**.

**MRC.** An abbreviation for the Maintenance and Redundancy Control function.

**MRC connection.** A connection type in which a connection is made to the MRC module.

**MS-DOS .** An abbreviation for Microsoft Disk Operating System.

**multiplexer.** A device that allows multiple devices to communicate with **hosts**, public data networks, or a data switch.

**Multipurpose Concentrator.** A **concentrator** consisting of a **modular cabinet** without a **Control Computer**. Connects to the **node** via optical fiber or wire **trunk**, and has interface slots for **TY12**, **BA12**, **TSM8**, **CPM-HS**, **CPM-422B**, **Sync8**, and **X.25** modules. Two types of Multipurpose Concentrators are available: 7-slot and 15-slot.

**MUX.** An abbreviation for multiplexer.

## N

**NAC.** An abbreviation for Network Access Controller (Network Access Control System) .

**NB.** An abbreviation for Network Builder (*StarKeeper II* NMS) .

**network.** 1. The interconnection of a number of points (nodes, computers, terminals, and so forth) by communications facilities. 2. Part of the *Datakit II* VCS addressing scheme that is equivalent to the overall network name. *See* **addressing**. *Also see* **area**; **exchange**; **service address**.

**network address.** A *StarKeeper II* NMS representation, input by keyboard characters, of a specified **network element**. The network address positively identifies the component. Often abbreviated *netaddr*.

**network administrator.** Individual responsible for the operation, administration, and maintenance of a network.

**Network Builder.** *StarKeeper II* NMS Graphics application used for configuration management and analysis. The application provides a Forms Interface to configure network elements.

**network connection.** A connection in which a *StarKeeper II* NMS host computer is cabled to a TY port on a node and uses the node to connect to a remote element.

**network elements.** The equipment and services that comprise a data communications network.

**Network Management System (NMS).** A centralized system used to operate, administer, and maintain an entire data communications network.

**Network Monitor.** *StarKeeper II* NMS Graphics application used for fault management by providing alarms and

diagnostics capabilities on geographic network maps. The application provides an easy-to-use map editor and can generate maps automatically.

**NM.** An abbreviation for Network management; network manager; Network Monitor (*StarKeeper II* NMS) .

**NMS.** An abbreviation for Network Management System .

**node.** 1. One or more BNS-2000 or *Datakit II* VCS cabinets containing a **Control Computer**, one **Clock module**, and one **Switch module**. 2. All backplanes sharing a transmit and a receive bus, connected by **Repeater modules**.

## O

**operating system.** The software that controls and allocates the resources, such as memory, disk storage and the screen display for the computer.

**option.** An addition to a command to improve or provide an extra enhancement to the command. The option is usually depicted with a minus (-) sign in front of it.

**originating group.** The type of **group** assigned to devices, such as data terminals, that can initiate calls to other devices.

**OS.** An abbreviation for operating system.

**overhead.** All information, such as control, routing, and error-checking characters, that is in addition to user-transmitted data; includes information that carries network status or operational instructions, network routing information, as well as retransmissions of user-data messages.

## P

**packet.** A unit of data transmitted through a network.

**packet assembler/disassembler (PAD).** A device that disassembles data for transmission and assembles it at data reception. A node performs PAD functions to connect the node to a **PDN** or **X.25 host**.

**PAD.** An abbreviation for Packet assembler/disassembler .

**paddle board.** The input/output distribution board at the rear of the node or concentrator cabinet that provides external connections to the interface modules.

**parameter.** 1. A variable that is given a constant value for a specified application and that may denote the application. 2. A name in a procedure that is used to refer to an argument passed to that procedure.

**parity.** Addition of non-information bits to data, making the number of ones in each grouping of bits either always odd (for odd parity), or always even (for even parity). This permits detection of a single-bit error in each transmitted or stored character.

**parity bit.** An extra bit added to a byte, character, or word to ensure that there is always either an even or odd number of bits according to the logic of the system. If, through a hardware failure, a bit should be lost in transmission, its loss can be detected by checking the parity. The same bit pattern remains as long as the contents of the byte, character, or word remain unchanged.

**parity error (PE).** A signal that flags a parity bit error.

**partition.** A section of the hard disk used to store an operating system and data files or programs. By dividing the disk into partitions, the space allocated can be used in a more efficient and organized manner.

**partitioned user.** A *StarKeeper II* NMS user with a login on the system and

access the commands specified by the network administrator.

**PC.** An abbreviation for Personal computer.

**PDN.** An abbreviation for Public Data Network.

**PE.** An abbreviation for Parity error.

**performance connection.** A connection in which performance measurement data is collected from nodes.

**Performance Reporter.** *StarKeeper II* NMS Graphics application used for routine assurance and long term engineering. Error counts, indicators, and thresholding are provided, as well as performance reports for trunk utilization and connections.

**pipelining.** The transmission of synchronous data as it arrives at the network interface, without waiting until a frame is filled.

**port.** An access point for data entry or exit.

**PQ (Priority Queuing).** *See* **Trunk-PQ**.

**PR.** An abbreviation for Performance Reporter.

**predefined destination (PDD).** An administered association of a fixed network destination with an originating end device, resulting in an automatic **call setup** request as soon as the originating device comes on-line. *Compare* **virtual circuit**.

**printer sharing.** An arrangement in which two or more Systems share the use of a printer by sending files through the wide area network to the **spooling host** that has a direct connection to the printer.

**program.** *See* *application*.

**Programmer's Interface.** A *StarKeeper II* NMS feature that allows the development of custom application programs through the use of scripting tools.

**protocol.** A formal set of rules governing message exchange between two communicating devices.

**PVC.** An abbreviation for Permanent virtual circuit.

## Q

**query.** A request for information (displayed on the terminal screen) from the system that requires a response from the user.

**queue.** A line or list formed by items in a system waiting for service.

## R

**RAM.** An abbreviation for Random access memory.

**reboot.** To reinitialize the operating system and *StarKeeper II* NMS.

**receiving group.** The type of group assigned to devices, such as host computers, that can receive calls from other devices connected to the **node**.

**remote *StarKeeper* NMS. 1.** A pre-R3.0 version acting as a subordinate to a Master Alarm Collector. **2.** In a distributed *StarKeeper II* NMS environment, The machine you are administering is viewed as the local machine and any other machine is a remote *StarKeeper II* NMS.

**reverse video.** A form of highlighting a character, field, or cursor by reversing the color of the character, field, or cursor with its background; for example, changing a red character on a black background to a black character on a red background.

**root.** The superuser login ID. You must log in as **root** to install software or to perform system administration tasks.

**RS-232-C.** An EIA standard for data communications, describing the electrical, mechanical, and functional

characteristics of the connections between devices exchanging data in serial binary form. RS-232-C connections are those cables and connectors conforming to this standard.

## S

**SA.** An abbreviation for Source address (SMDS); Service Area (X.121).

**SAM.** An abbreviation for Synchronous/Asynchronous Multiplexer.

**SAMML.** A Synchronous/Asynchronous Multiplexer Multiport Link.

**SAM Multiport Link.** An interface module in a node providing connection to up to 8 **SAMs**.

**SAMSL.** A Synchronous/Asynchronous Multiplexer Single Link.

**SAM16.** An abbreviation for Synchronous/Asynchronous Multiplexer 16-port.

**SAM64.** An abbreviation for Synchronous/Asynchronous Multiplexer 64-port.

**screen blanking.** A feature that causes a screen to go blank if no keyboard or **mouse** input occurs within a specified number of minutes.

**SCP.** An abbreviation for Seamless Communication Platform.

**SCSI.** *See* **Small Computer System Interface**.

**SDLC.** *See* **Synchronous Data Link Control**.

**SDLC8.** *See* **Synchronous Data Link Control Module, 8-port**.

**SDS.** An abbreviation for Software Disk Stripping.

**SFT.** An abbreviation for Standard Fiber Trunk (interface module) .

**segment.** A protocol data unit of 53 octets.

**select.** To choose an object or objects on the screen for which an action is intended.

**server.** A machine in a network that provides a particular service to other machines; for example, a database server manages a large database.

**service address.** An administered identifier for a destination in the *Datakit II* VCS network.

**Session Maintenance.** A feature that provides data transport reliability over inter-nodal trunks between ECPU Systems in BNS-1000, BNS-2000, and *Datakit II* VCS networks.

**setup.** 1. In a computer that consists of an assembly of individual computing units, the arrangement of interconnections between the units, and the adjustments needed for the computer to operate. 2. The preparation of the system for normal operation.

**shelf.** A carrier inside a cabinet that contains a **backplane** and other hardware. It supports the insertion of modules into the backplane.

**SIG.** An abbreviation for SMDS Interest Group.

**Small Computer Systems Interface (SCSI).** Pertaining to the ANSI-defined standard for attaching intelligent peripherals to computers.

**SMDS.** An abbreviation for Switched Multi-megabit Data Service.

**SNA.** An abbreviation for System Network Architecture.

**SNI.** An abbreviation for Subscriber Network Interface.

**SNMP.** An abbreviation for Simple Network Management Protocol (Internet/TCP/IP standard).

**Software Package System.** *StarKeeper II* NMS software that is sent to the customer, who installs it on his or her own hardware.

**SP.** An abbreviation for Software Package.

**speedcall.** An administered shortened name or short code for a network destination **address**.

**spooling host.** The computer with a **direct connection** to the printer when two or more systems share the same printer. In a client-server model, the spooling host is a print server.

**SQL.** An abbreviation for Structured Query Language.

**SR.** An abbreviation for Special report (SMDS); Service Region (X.121) .

**SS.** An abbreviation for Staged System.

**Staged System.** A *StarKeeper II* NMS system shipped from the factory equipped with specified software and host connection hardware.

**Standard Fiber Trunk (SFT).** An **interface module** for an optical fiber connection between two **nodes**, a node and an **MPC**.

**Standard Wire Trunk (SWT).** An **interface module** for a wire connection between two **nodes** or a node and a **concentrator**.

**StarGROUP®.** A name for a star network configuration that connects Local Area Networks.

**StarGROUP Interface Module–Bridge (SLIM-B).** An **interface module** that supports LAN bridging.

**StarGROUP Software VCS Access Program.** Asynchronous gateway server.

**StarKeeper® II Network Management System (NMS).** A centralized system used to view an entire network and mon-

itor, control, configure, and diagnose any **node** in the network.

**StarKeeper II NMS connection.** A connection type in which the transfer of configuration information between StarKeeper II NMS machines is permitted.

**Subscriber Network Interface (SNI)** The SNI is the interface between a carrier's SMDS network and the subscriber-owned, Customer Premises Equipment (CPE). At this interface, the CPE attaches to an access facility—such as a DS1 digital transmission facility (DTF)—that connects it via a dedicated path to the AI module.

**superuser.** A user with OS administrative privileges.

**supported applications.** Applications for which Lucent Technologies provides telephone hot line assistance and client-site software support.

**SVC.** An abbreviation for Switched virtual circuit; service connection(s) .

**SWT.** An abbreviation for Standard Wire Trunk (interface module) .

**Switched Multimegabit Data Service (SMDS)** A high-speed, connectionless, public packet-switched service. SMDS can interconnect local area networks (LANs) through a wide area network (WAN) or across a metropolitan area to form a *metropolitan area network* (MAN) using a network-to-network interface called an Intercarrier Interface (ICI). When using SMDS across a wide area network, multiple carriers and multiple networks are interconnected.

**synchronous.** Transmission in which the data characters and bits are sent at a fixed rate with the transmitter and receiver synchronized. *Compare asynchronous.*

**Synchronous Data Link Control (SDLC).**

A link-layer, bit oriented protocol, similar to HDLC, used primarily by IBM devices.

**Synchronous Data Link Control Module, 8-port (SDLC8).** An interface module for SNA/SDLC hosts to the network, used in conjunction with the LAN Communications System (LCS100 Network Gateway). Multiple LCSs can originate and receive circuit calls through a CPMML to a single SDLC8 port.

**syntax.** The format of a command line.

**T**

**terminal emulator.** An application that makes the host terminal appear to be another type of terminal; this change of appearance is for the benefit of the connecting device, which recognizes the terminal being emulated.

**text field.** An area in a **window** where text is entered from the keyboard.

**toggle.** 1. The name given to a switch that changes for every input pulse or, any simple two-position switch. 2. The action of going back and forth between two conditions.

**T1.** A digital carrier (wire transmission) facility providing 1.544 Mbps of bandwidth (2 Mbps. internationally).

**T1 Trunk.** A module in the SAM64, SAM504, or VDM-SAM504 that is a counterpart to the **TRUNK-T1** module in the **node**.

**Transparent Synchronous Module (TSM8).** A transparent synchronous 8-port interface module that supports synchronous or asynchronous communication.

**TRK.** An abbreviation, on a screen, for trunk.

**trm.** An abbreviation for terminal emulation software (*StarKeeper II NMS*).

**troubleshooting.** The process of finding the cause of a problem in a system and taking actions to fix the problem.

**trunk.** A **facility** connecting two nodes.

**TRKE3S.** A Trunk-E3 SMDS interface module to a T1 transmission facility between two nodes.

**TRKT3.** A Trunk-T3 interface module that supports connection-oriented (CONS) and connectionless traffic between nodes at transmission speeds up to T3.

**TRKT3I.** A Trunk-T3 Interexchange connection-oriented and connectionless ICI interface module.

**TRKT3.** A Trunk-T3 Screening connection-oriented and connectionless SMDS interface module.

**TRK64.** A wire interface module that provides communications between nodes over a Digital Data Service (DDS) line, using one of two I/O boards (AWJ9, AWJ11).

**Trunk-DDS.** A Digital Data Service (DDS) trunk module consisting of a single-board processor (MC5P033A1) and an SC/DK1 interface board (UN221). The SC/DK1 board is on the left side of the module and contains the module switches and LEDs.

**Trunk-HS.** A High Speed (HS) fiber interface module that uses the AWJ2 I/O board to provide connections between nodes as well as connections between nodes and SAM504 and SAM64 modules. The counterpart for the Trunk-HS in the SAMs is the HS-Trunk module. Refer to the Synchronous/Asynchronous Multiplexer Reference for a description of the HS-Trunk module.

**Trunk-PQ.** A Priority Queuing (PQ) single port wire interface module that provides fair queuing and enhanced buffering for multi-protocol traffic, and enforcement of Committed Information Rate (CIR) for

frame relay traffic at up to T1/E1 rates. The AWJ24 I/O board provides a V.35 DTE connection to the external device.

**Trunk-SFT.** A Standard Fiber Trunk interface module that links nodes over fiber optic cable to other nodes and to ISN concentrators and MPCs. The maximum cable length for fiber trunks is 2.91 km.

**Trunk-SWT.** A Standard Wire Trunk interface module for wire trunks between nodes and from nodes to ISN concentrators and MPCs. A variety of connections can be made by selecting the appropriate I/O board. For more detail, refer to the *DataKit II VCS Trunk Module Reference Trunk Module Installation*.

**Trunk-T1.** An interface module for wire trunks that provide long-distance, high-speed point-to-point communication over a T1 digital transmission facility between nodes. The Trunk-T1 module is used with an AWJ4 I/O board that provides

**TSM8.** *See* **Transparent Synchronous Module (TSM8)**.

**TSM-T1.** A transparent synchronous T1 interface module.

**two-way (2-way) group.** The type of **group** assigned to devices that can originate and receive calls to and from a node.

**turnkey shutdown.** The capability to automatically log off of application programs on system shutdown.

**TY12.** A 12-port asynchronous **interface module**.

## U

**UAI.** An abbreviation for Uniform Alarm Interface (*StarKeeper II NMS*) .

**UART.** An abbreviation for Universal asynchronous receiver/transmitter (integrated circuit) .

**uname.** (unique name); the local HP-UX machine name.

**UNIX system.** A general-purpose, multi-user, interactive, time-sharing operating system used with your computer.

**upgrade.** The latest release of *StarKeeper II NMS* to be installed on a system running an earlier release.

**upload.** From the viewpoint of the reference computer or node, the act of sending data to another computer or storage device. *See* **download**.

**utilities.** A group of programs combined into a package that represent a specific application available with your computer.

**USART.** An abbreviation for universal synchronous/asynchronous receiver/terminal.

## V

**validation.** The application's verification that the contents of a text field are appropriate to the function.

**virtual circuit.** A connection between a source and destination in a network that is realized by network addressing through switching elements, as opposed to a direct hardwired connection.

**voice/data multiplexer (VDM).** A device that allows the sending and receiving of simultaneous voice and data transmissions through existing telephone lines.

## W

**wide area network (WAN).** A communications network that can cover an area with a radius of greater than 3km.

**wild card.** A method, used in *StarKeeper II* NMS network addressing, to expand the matching criteria when searching for specified records in the database. (*Compare anchor*).

**Workstation Administration Application.** A Graphics System application that allows a Workstation Administrator to oversee administrative tasks.

## X

**X.25.** An interface module that supplies X.25 services, allowing X.28 hosts and asynchronous terminals to connect to a public data network (PDN) or other X.28 hosts.

**X.75.** An interface module that supplies X.75 services.

**X.121.** A CCITT recommendation for an addressing scheme in Public Data Networks. (Part of the **X.25** protocol.)

**X station.** A supported device, on a Local Area Network, that supports *StarKeeper II* NMS graphics application packages.



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