**450-1011-501**

Network Operations Systems

# DNC-50, DNC-100, DNC-500 Dynamic Network Control Systems

## Maintenance and Troubleshooting Guide

Release: NSR27/28 02 Status: Standard

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# DNC-50, DNC-100, DNC-500* Dynamic Network Control Systems

## Maintenance and Troubleshooting Guide

Publication number: 450-1011-501
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# Table of contents

# 1. Introduction

This document provides on-site maintenance and troubleshooting information for the DNC-50, DNC-100, and DNC-500 Dynamic Network Control Systems. It is intended to support trained maintenance personnel.

The maintenance personnel may be an employee or employees of the customer, if the customer has elected to take responsibility for on-site maintenance. However, the maintenance personnel may also be employees of the telephone company (if a leased system) or Northern Telecom, if a service contract is purchased from Northern Telecom.

The procedures in this document are designed to serve all of these arrangements. However, depending on contractual arrangements, responsibilities for specific tasks may rest with different parties. In all cases, the terms of your maintenance contract override any information in this document.

## Revision History

### Changes to NSR27/28.02 Version (March 30, 1990)

The procedure for vacuuming the DNC cabinets has been updated.

### Changes to NSR27/28 01 Version (November 10, 1989)

(a) The procedures for cleaning the Cartridge Tape Drive are expanded to include the tape drive in the 1/4-wide tape SRU. It has a different orientation than the tape drive in the mass storage SRUs. These procedures are in Part 2. They are applicable to both NSR27 and 28.

### Changes to NSR27 02 Version (May 12, 1989)

(a) This NTP is converted to a new document style for NSR27.

(b) The troubleshooting and fault-clearing procedures in Part 3 are expanded from the NSR26 Standard version.

## Document Release Information

The release information for this document is found on page i. The information includes the 10-digit identification number for the practice, plus the following additional information:

(a) **Date:** This is the date the document was released for reproduction or printing. It is not intended to be the same as the software or product release date.

(b) **Product release:** This is the software or product release number associated with the current issue of the document, plus the issue number of document. The format is NSRaa bb, where:

- NSRaa is the Network Software Release number
- bb is a sequential issue number for the document that indicates how many times the document has been released with the specified software release.

(c) **Document release:** A rating code of Draft, Preliminary, or Standard is assigned to the document, reflecting the current status of the document.

## An Overview of the Maintenance Tasks

The tasks in this document are divided into three categories. One is **Routine Maintenance,** which documents the simple routine maintenance tasks required by the system. Routine maintenance is always the responsibility of the customer, regardless of whether the customer has purchased a maintenance contract. These tasks consist of periodically cleaning the fan filters at the bottom of the cabinets and cleaning the heads of the tape units.

The second category includes the **Troubleshooting and Fault Clearing** procedures. These procedures are used to identify the source of faults and potential solutions. The Maintenance Service of System Administrative Services supports these procedures.

The Maintenance Service is a software program provided with the system's base software that isolates and diagnoses faulty equipment and software. Faulty units are automatically taken out of service by the system. The system also provides for manually taking units out of service.

The third category is **Replacing Cabinet Subassemblies.** Because of the system's modular design, most equipment can be quickly removed and replaced by spare units. (The customer should have a spare for each type of equipment on the site.) Except for the specific cabinet subassemblies documented here, the equipment should be removed and replaced according to the detailed procedures in the Installation Guide for Cabinet Systems, 450-1011-201.

## How to Use this Guide

To simplify the use of the document and to improve its readability, the tasks are described from the point of view of the maintenance personnel doing the actual work. There may, however, be more than one person using the procedures.

Also, other documents are used with this document, such as the Installation Guide for Cabinet Systems, 450-1011-201, for removing and reinstalling faulty equipment, and the Guide to System Administrative Services, 450-1011-301, for detailed information on how to use the system's Maintenance Service and log messaging utility.

The maintenance personnel must either coordinate their efforts with the system administrator, or be given access to System Administrative Services by the system administrator.

## Getting Ready

Before starting any maintenance or troubleshooting tasks, ensure that you have read the introduction of this document. Then, if you are going to install or remove equipment, you should review the appropriate supporting documents, such as the Installation Guide for Cabinet Systems, 450-1011-201, and the Guide to System Administrative Services, 450-1011-301.

Also, you should ensure that you have on hand the Site Records, 450-1011-152, so that you can make notations on the provisioning worksheets. A list of tools is provided below for your convenience. Specific tools required for a given procedure are noted in the procedure itself.

**TOOLS:**

1 hexagonal nutdriver (1/4 inches)

1 hexagonal nutdriver (3/8 inches)

1 hexagonal nutdriver (3/16 inches)

1 Allen wrench (5/64 inches)

1 small flat-blade screwdriver.

**MATERIALS:**

1 felt pen

1 pencil.

# 2. Routine Maintenance

The system is based on solid state circuitry that requires little routine maintenance. However, its efficient operation does depend on the periodic cleaning or replacement of the air filter in each cabinet and the tape heads of the cartridge tape units. Both tasks can be performed with the system fully operational.

## Servicing the Air Intake Filter

**TOOLS and MATERIALS:**

1 vacuum (brushless motor), - or

1 replacement air filter (part number PO642355) for each DNC cabinet

The DNC cabinets must be vacuumed to prevent the buildup of electrostatic discharges caused by dust. Use a vacuum cleaner with an induction-wound (brushless) motor, and with plastic or rubber attachments. (Series-wound motors cause electromagnetic interference.) Battery operated vacuum cleaners can suffice for small applications or areas without power. Vacuum inside or around the DNC cabinets each time the frames' filters are inspected, until an appropriate vacuuming schedule is determined. Do not bump any part of the vacuum cleaner against equipment, and especially avoid metal to metal contact.

The air intake filter at the bottom of each cabinet should be cleaned once a month in ordinary office environments. Inspect the filters on new systems more frequently to determine the filter cleaning interval appropriate for your system. Typically, only damaged filters need replacing.

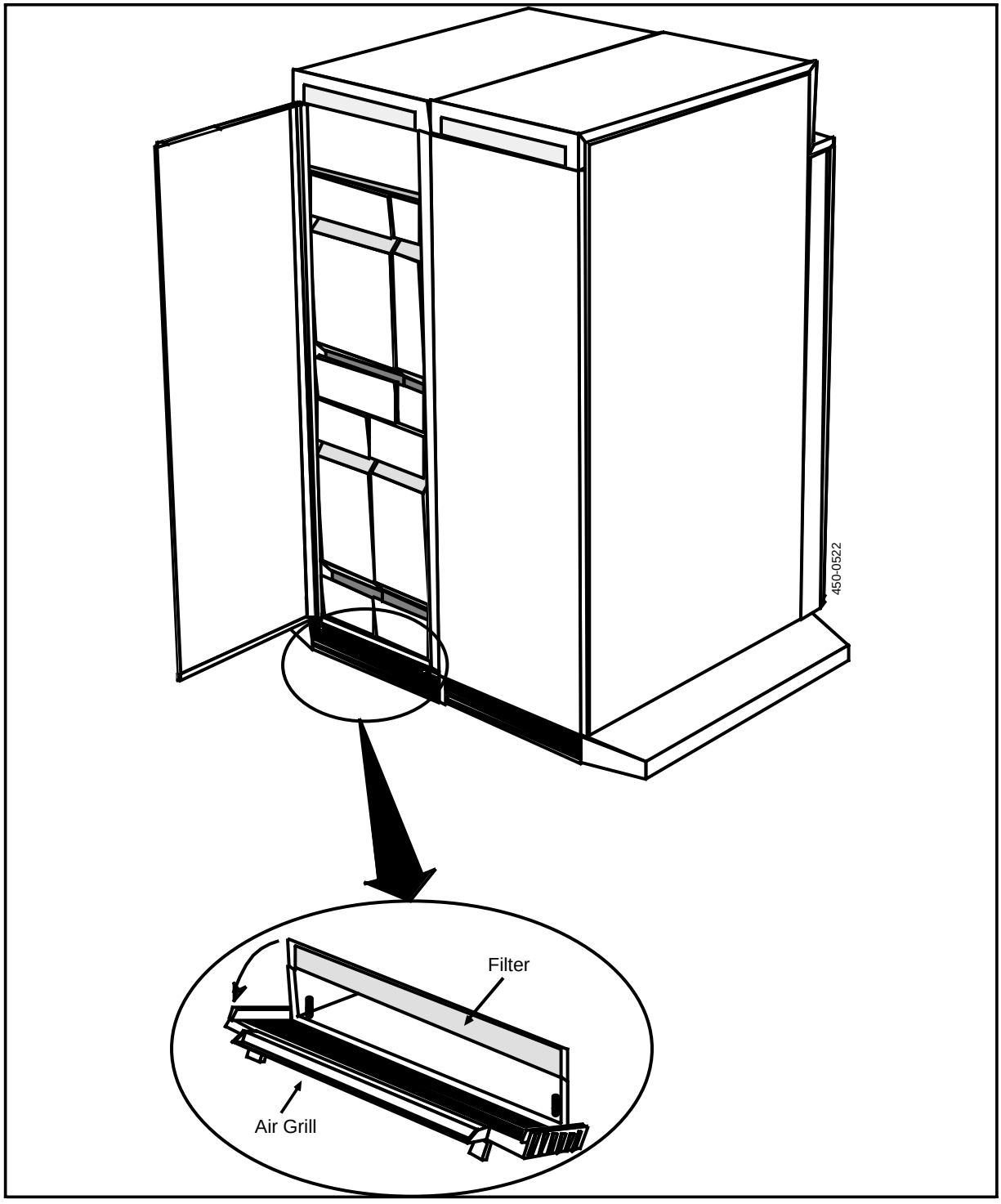
To access the filter, proceed as follows:

(1) Open the front door of the cabinet. An air grill is located at the bottom of the cabinet as shown in Fig. 2-1.

(2) Grasp the two tabs at the top of the air grill and pull the top of the grill outward (the grill is hinged at the bottom).

(3) The filter lies just beneath the cabinet door. Pull the filter out of the cabinet.

**Figure 2-1**
**The Air Intake Grill and Filter**



(4) You can now clean the filter with a vacuum or replace it with a new filter.

(5) Insert the new or cleaned filter into the filter slot and slide it in until the air grill can be freely closed.

(6) Close the air grill, snapping it into position.

(7) Close the cabinet door.

(8) Repeat Steps 1 to 7 for each cabinet in the system.

## Cleaning the Tape Heads of the Cartridge Tape Units

**Tools:**

- denatured (isopropyl) alcohol
- foam or lint-free swabs, 6 in. long.

**Steps**:

(1) Locate the tape heads inside the SRU slot that accepts the cartridge tape.

***Mass Storage and Cartridge Tape SRUs:*** the heads are located inside and at the rear of the cartridge slot. See Figure 2-2.

***1/4-shelf Disk/Tape SRUs:*** the heads are located inside and at the top of the cartridge slot. See Figure 2-3.

(2) Dampen (don't saturate) a foam swab with denatured alcohol and wipe the swab over the tape heads.

Use a cleaning motion at right angles to the direction of tape travel. Avoid touching any rubber parts with the alcohol. Some deterioration of the rubber can result.

(3) With a dry swab, wipe any excess alcohol from the tape heads, also using a motion at right angles to the tape travel.

**- CAUTION -**

To ensure proper operation, carefully clean the tape heads after the system loads for the first time, and before every tape drive session.

**Figure 2-2**
**Tape Head Location in the Mass Storage or Cartridge Tape SRU**

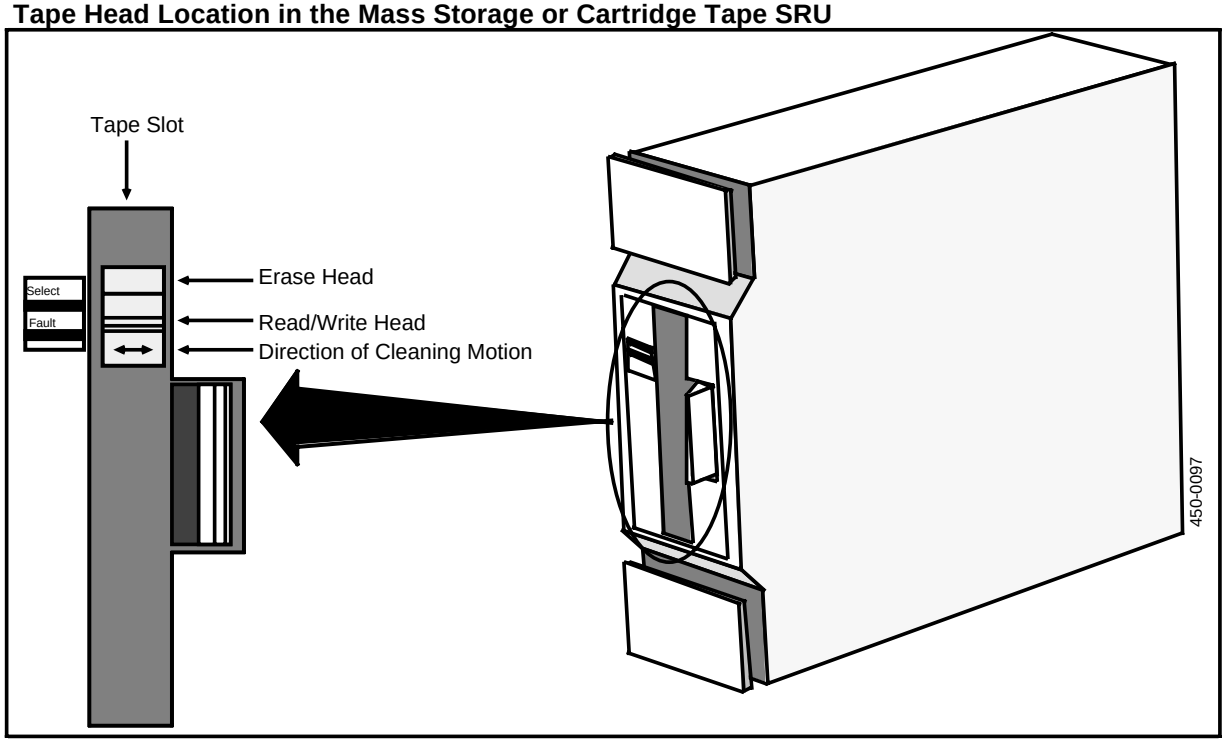
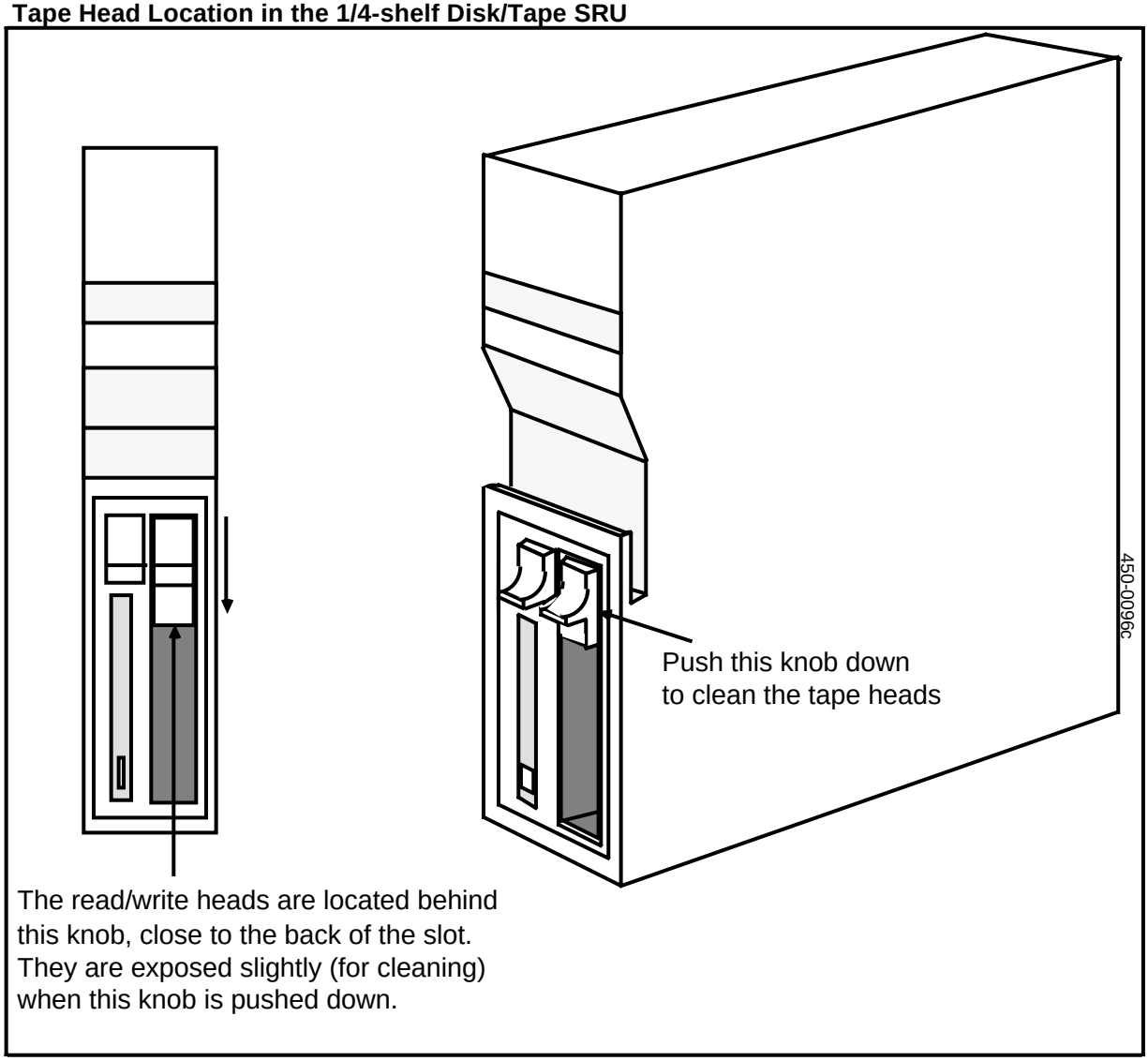


**Figure 2-3**
**Tape Head Location in the 1/4-shelf Disk/Tape SRU**



# 3. Troubleshooting and Fault Clearing Procedures

Troubleshooting usually begins when someone, such as a user or the system administrator, notices a symptom of a fault. It may be that a piece of equipment is not functioning properly, an alarm has been generated, or the system has displayed a fault message on the notification line of the terminal screens or on the liquid crystal display (LCD) of the SASI Primary Processor. (The Primary Processor is typically located in the first or second cabinet from the left, as viewed from the front.)

The system administrator also has access to the system's self-diagnostics and fault reporting software to periodically check the operating status of all shared resource units (SRUs), remote resource units (RRUs), and program resource units (PRUs). Units can be taken out of service manually at any time, and are automatically taken out of service if identified as faulty by the system's self-diagnostics.

The self-diagnostics operate under control of the Maintenance Service of System Administrative Services. This service displays and tests the status of resource units. On notification of a fault, the system administrator can access this service, potentially identify and isolate the fault, and take the faulty unit out of service. Corrective action may then be taken.

For software faults, the problem can be cleared by reloading the PRU. This action can be performed by the system administrator using the instructions in Part 25 of the Guide to System Administrative Services, 450-1011-301.

If the fault is hardware-related, the system administrator should contact the appropriate maintenance personnel according to the terms of the customer's maintenance contract or other maintenance arrangement. The maintenance personnel are responsible for replacing faulty equipment.

In some cases, the fault may not be identified by the system's self-diagnostics. In such a case, refer to Table 3-A for troubleshooting procedures. If a hardware unit is faulty, remove it and install a spare according to the procedures of the Installation Guide for Cabinet Systems,

450-1011-201. If a cabinet subassembly is faulty, remove it and install a spare according to Part 4 of this document.

The Installation Guide for Cabinet Systems provides procedures for installing the following equipment:

- cabinets
- cabinet doors
- input, horizontal, and terminating jumper assemblies
- shared resource units
- LAN interface units
- the office cross-connect panel
- connections to peripheral equipment.

## Fault-Clearing Summary: Symptoms and Solutions

On notification of a fault in the system, you will want to gather as much information as possible from the person reporting it. Ask the person reporting the fault what the symptoms are, under what conditions the fault occurs, whether it is intermittent or ongoing, whether it can be reproduced, and any other relevant information there may be.

You will want to contact the system administrator for any additional information, such as reports or log messages recorded by System Administrative Services. With this information, you can then refer to the following procedure and Table 3-A for a summary of symptoms and solutions for potential system faults.

The following procedure is a summary for troubleshooting hardware and software faults in the system.

> ***Note:*** The system log messages can be of use in determining the cause of a system malfunction.

(1) Access the Maintenance menu in SAS to determine the status of each SRU, RRU and PRU.

> ***Note:*** If you cannot access the system from the administrator's terminal, proceed to Step 8 for instructions on how to clear a major fault.

(2) For each device whose status is other than ‘Working’, invoke a ‘Courtesy Down’ function followed by a ‘Put Into Service’ to reboot that device. Note the following conditions:

a) The rebooting function for software PRUs resident on an SRU may lag behind the rebooting function of the actual hardware SRU. For example, the SRU may indicate a ‘Working’ status before the PRU. Allow sufficient time to complete the operation (at least five minutes).

b) The SRU/RRU/PRU may need to be rebooted more than once to restore the status to ‘Working’.

c) The ‘Courtesy Down’ function is not allowed for units that have special importance within the system. If such a unit is faulty, then the entire system must be rebooted. (See ‘Rebooting the System’, below.) The restricted units are:

- the Primary Processor SRU and most core system PRUs
- the LANlink SRU that supports the system administrator's terminal
- the system administrator's terminal
- any PRUs resident on the Primary Processor that support the System Administrative Services (SAS) menu functions.

(3) If an RRU continues to have a ‘Faulty’ status, replace it

***Note:*** Before removing a SCSI (Small Computing Systems Interface) cable from any equipment, the system must be powered down.

(4) After replacing a faulty RRU, reboot the device using the ‘Courtesy Down’ and ‘Put into Service’ functions.

(5) If an SRU continues to have a ‘Faulty’ status, power the system down and replace the SRU.

**- CAUTION -**

You must power the system down if you intend to remove or reseat any SRU, or if you intend to remove a SCSI (Small Computing Systems Interface) cable from any device.

(6) If the program resource units (PRUs) in an SRU repeatedly have a ‘Faulty’ status, power the system down and replace the SRU.

(7) After replacing an SRU, power the system up and reboot the device using the ‘Courtesy Down’ and ‘Put into Service’ functions.

(8) If you cannot access the system from the administrator's terminal, reinitialize the system using the backup tape (if available), or do a complete system rebuild.

(9) If the system reinitialization does not complete successfully, power the system down, replace the Primary Processor SRU, power the system up again, and attempt to reload the system from the backup tape (if available), or do a complete system rebuild.

If the system fails to reboot successfully, power the system down, replace the Mass Storage SRU, format the disk, and again attempt to reload or rebuild the system.

If you continue to have problems, contact Northern Telecom's customer service center.

## Rebooting the System

Rebooting the system is a last-resort method of remedying an error condition. There are three ways to reboot a DNC:

- using the software reboot feature
- pressing the **Reset** button on the Primary Processor SRU (if the system is equipped with a 68020 XP primary processor)
- powering down and then powering up again.

## Using Software Reboot

If you are the superuser, you can reboot the system by using the software reboot feature. (Only the superuser can access the Utilities Services - Main Menu, as required by this procedure.) Take the following steps:

(1) Sign on as the superuser.

The main menu appears.

(2) Select the System Administrative Services option and press ENTER.

The System Administrative Services - Main Menu appears.

(3) Select the Utilities option and press ENTER.

The Utilities Services - Main Menu appears.

(4) Select the Helix Command Interpreter option and press ENTER.

The system prompt appears. (It is usually ‘>’.)

(5) Type in the command

**:LOCAL:UUTILS:SOFTBOOT**

(in capital letters, lowercase letters, or a mixture), and then press ENTER.

The system prompts you to specify whether you want to quit the program, reboot immediately, or reboot after a delay.

**To reboot immediately, follow Step 6.**

(6) If you want to reboot immediately, type in **1** and press ENTER.

On your terminal screen, the system displays a message stating that it is resetting all processors. Users' terminals beep, and display a message stating that the system is rebooting at the administrator's request.

**To reboot after a delay, follow Steps 7 and 8.**

(7) If you want to warn users in advance of the reboot, type in **2** and press ENTER.

The system prompts you for the number of minutes it is to wait before rebooting. You can specify a whole number in the range 1 to 10.

(8) Type in a whole number in the range 1 to 10 and press ENTER.

The system acknowledges by displaying the message:

Wait n minutes (from hh:mm) for reboot

where n is the whole number you specified, and hh:mm is the current time. Users' terminals beep and display a message stating that the system will reboot in n minutes at the administrator's request.

When the specified delay has elapsed, users' terminals beep again, and display a message stating that the system is rebooting at the administrator's request.

## Using the Reset Switch

If your DNC is equipped with a Primary Processor XP 68020-7, you can use the reset switch on the front of the SRU to reboot the system. Proceed as follows:

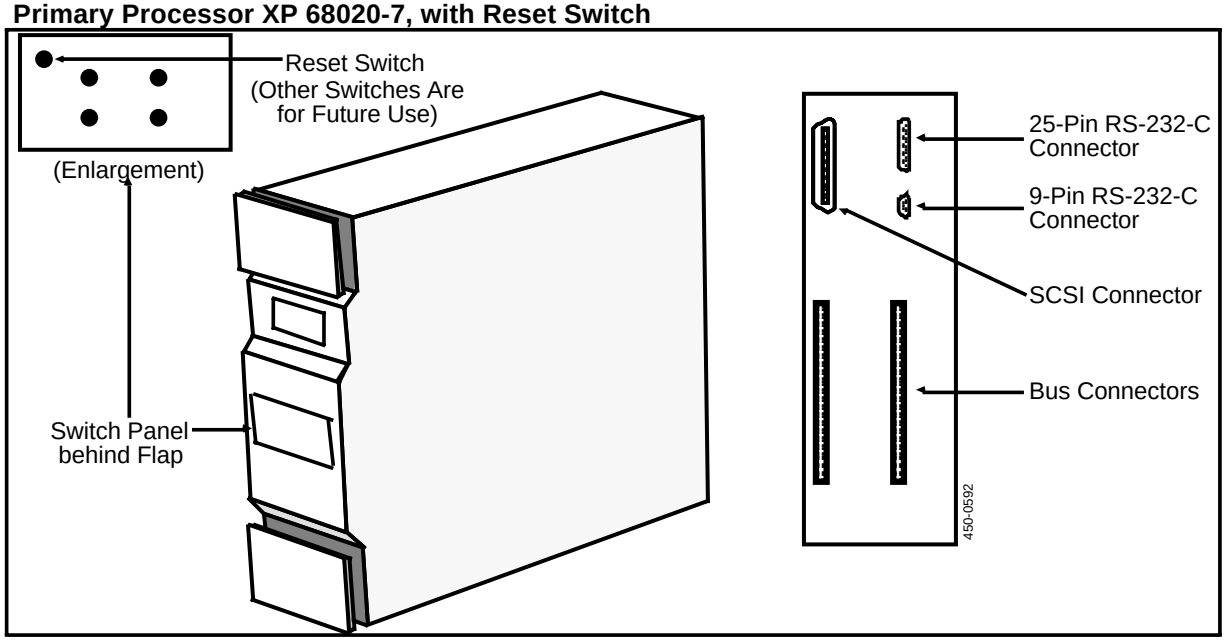
(1) Open the front door of the cabinet containing the Primary Processor SRU.

(2) Open the flap on the front of the SRU. (See Figure 3-1.)

(3) Press the reset switch.

The system reboots.

**Figure 3-1**
**Primary Processor XP 68020-7, with Reset Switch**




## Powering Down and Powering Up

To reboot by powering down and then up, proceed as follows:

(1) Power down the DNC. If your system has input jumper assembly NT4G42CA or later, use an on/off switch located on the jumper assembly. This is on the rear of cabinet 1 when viewed from the rear. If your system does not have an on/off switch, unplug the ac input cord at the input jumper assembly at the rear of cabinet 1. Cabinet 1 is the right-most cabinet, as viewed from the rear.

(2) Wait at least 30 s, to allow the Power SRU time to discharge.

(3) Power up the DNC.

(4) When prompted (after approximately five minutes), enter the date and time.

**Table 3-A**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| **SAS PROBLEMS/SYSTEM REBOOT PROBLEMS** | | |
| System Administrative Services is unable to start. | Another user is using SAS. Only one user at a time is allowed. | Try again when no one else is using SAS. |
| | The terminal is not connected to the primary processor. | Check cabling and system configuration to ensure that the terminal can communicate with the primary processor. |
| | There is a software fault. | Reboot the system. (For instructions, see 'Rebooting the System', earlier in this part.) |
| Rebooting fails. | There are faults in the cabling to the disk devices. | Power the system down and check all disk connections for improperly seated cables, bent pins, shorts, and opens. |
| | There is a primary processor fault. | Power the system down and replace the primary processor SRU. |
| | The system disk may have been marked as write-protected. | Investigate this possibility. (See WRITE-PROTECTED SYSTEM DISK in this table.) |
| **WRITE-PROTECTED SYSTEM DISK** | | |
| ***Note:*** The following symptoms indicate that the system disk has been marked as write-protected. If these symptoms exist, contact NT field support. | | |
| First, if you try to create a directory on the :LOCAL disk, the system generates a HELIX 109 error (access denied) or 115 error (file server is write protected). | | |
| Second, you cannot initiate System Administrative Services. | | |
| Third, you cannot reboot the system. | | |
| **POWER FAULTS** | | |
| ***Note:*** Cabinets can be equipped with several types of power supply. If powered from an ac source, either Power Supply SRUs (installed in the bottom shelves of the cabinets) or Loft Power Supplies (installed in the air plenum at the top of the cabinet) are used. If powered from a -48 V source, a -48 V Power Converter SRU is used. | | |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| The Power Supply SRU is equipped with a power-on LED indicator built into the circuit breaker on the front panel. The breaker is intended to trip if an overcurrent condition occurs (10 A).<br><br>The Loft Power Supply (one per cabinet) is fused for protection against over-voltage conditions. It has a green LED that indicates normal operation. If the fuse blows, the Power Supply must be removed. A reserve Power Supply SRU is provided in the bottom shelf of one of the cabinets and acts as a hot standby should any of the Loft Power Supplies fail.<br><br>**Power down the system before taking any action that may cause a nonfunctioning Power Supply SRU to become active (actions like reseating the SRU or switching it on).** Power Supply SRUs should not be switched off or on while the system is operational, because such an event causes a current surge that can trip the switches on other Power Supply SRUs to the off position. | | |
| None of the fans in a cabinet is working, and the LED display on the Power Supply units are not lit. | The power cord is not plugged into the ac outlet. | Plug the cord into the ac outlet. |
| | The power cord is not plugged into the input jumper assembly. | Plug the power cord into the input jumper assembly. |
| | The switch on the input jumper assembly (where so equipped) is switched OFF. | Switch the power ON. |
| | The power cord is defective. | Power the system down, detach the power cord, and use a multimeter to check the power cord for an open or shorted circuit. Replace the cord if it is defective. |
| None of the fans in a cabinet is working, but the LED displays on the Power Supply units are lit. | There is a power fault in a horizontal jumper assembly. | Replace the horizontal jumper assembly. |
| | There is a hardware fault in the cabinet backplane. | Replace the cabinet. |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| In systems powered by the Power Supply SRUs, the LEDs on all Power Supply SRUs are not lit. | The circuit breaker on one or more Power Supply SRUs is in the off position. | Power the system down, reset the circuit breakers by pressing '1' on the rocker switch on the front of each SRU, and power up the system. If a breaker continues to trip, the Power Supply SRU may be defective. To verify that it is defective, power the system down and replace the Power Supply with a replacement unit.<br><br>***Note:*** The system should have enough Power Supply SRUs installed so that one can go out of service and the remaining SRUs share the load. However, if the system power drain is too great for the remaining Power Supply SRUs, the system may go down if one Power Supply fails. |
| | One or more of the Power Supply SRUs is not properly seated. | Power the system down and reseat the Power Supply SRUs. |
| | The ac bus is defective. | Power the system down, detach the power cord, and use a multimeter to check the ac bus for an open or shorted circuit. Detach the inter-cabinet connectors if necessary. If the bus is defective, contact NT field support. |
| A power-on lamp on one Power Supply SRU is not lit, but is lit on the other Power Supply SRUs. | The Power Supply SRU is defective. | Power the system down and replace the Power Supply SRU. |
| **AIR-FLOW FAILURE** | | |
| Air flow at the rear vents of one cabinet is reduced or blocked. | If there is no power fault as indicated for Power Faults (above), one or both fans are blocked or have failed. | Check for a foreign object blocking the fans. If a fan is not functioning, replace it. |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| **PRIMARY PROCESSOR FAULTS** | | |
| With the power on, the liquid crystal display on a SASI Primary Processor SRU does not show any messages. The cabinet's cooling fans are working. | The Primary Processor SRU is not properly seated. | Power the system down and reseat the Primary Processor SRU. |
| | The Primary Processor SRU is defective. | Power the system down and replace the Primary Processor SRU. |
| With the power on, the liquid crystal display on a SASI Primary Processor SRU does not show any messages. The cabinet's cooling fans are not working. | There is a power fault | See Power Faults, earlier in this table. |
| **MASS STORAGE SRU FAULTS** | | |
| With the power on and the tape installed (80-megabyte versions), the select and fault indicators on the Mass Storage SRU do not light.} | The Mass Storage SRU is defective. | Power the system down, replace the Mass Storage SRU, and reload the system software. |
| With the power on, the liquid crystal display on a Primary Processor SRU displays the message: "Could Not Reset Disk". (Some versions of SCSI-type Primary Processor SRUs do not have displays; in this case, check for log and alarm messages.) | The Mass Storage SRU is not properly seated. | Power the system down and reseat the Mass Storage SRU. |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| | There is a cabling fault between the Primary Processor SRU and the Mass Storage SRU. | Power the system down. Check that the cable is free of shorts, open or broken wires, and bent pins. Ensure that it is securely connected. Reboot the system by powering it up again. In units with a built-in cartridge tape drive, this fault can also be indicated by the fact that the tape drive does not chatter as it attempts to load from tape. |
| | The Mass Storage SRU is defective. | Power the system down and replace the Mass Storage SRU. |
| With the power on, the liquid crystal display on a Primary Processor SRU displays the message: "Disk Load Failed". (Some versions of SCSI-type Primary Processor SRUs do not have displays; in this case, check for log and alarm messages.) | There is a cabling fault between the Primary Processor SRU and the Mass Storage SRU. | Power the system down. Check that the cable is free of shorts, open or broken wires, and bent pins. Ensure that it is securely connected. Reboot the system by powering it up again. |
| | The Mass Storage SRU's cable is not connected. | Power the system down and connect the cable. |
| | There is a power fault. | Clear the power fault and reboot the system by powering it up again. |
| | An SRU is improperly seated. | Power the system down, reseat the SRU, and power the system up. |
| | The Mass Storage SRU is defective. | Power the system down and replace the Mass Storage SRU. |
| The system displays messages indicating that disk data is corrupted. | | Reformat the disk. For detailed instructions on reformatting, refer to 450-1011-302. |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| **CARTRIDGE TAPE UNIT FAULTS** | | |
| With the power on, the liquid crystal display on a Primary Processor SRU displays the message: "Could Not Reset Tape." | There is a cabling fault between the Primary Processor SRU and the SRU providing the cartridge tape drive used for loading system. programs and data. (This may be an 80-megabyte Mass Storage SRU or a Cartridge Tape SRU.) | Power the system down. Check that the cable is free of shorts, open or broken wires, and bent pins. Ensure that it is securely connected |
| | The SRU used for loading system programs and data is defective. | Power the system down and replace the defective SRU. |
| With the power on, the liquid crystal display on a Primary Processor SRU displays the message "Could Not Read Tape". | The read/write heads of the tape unit are dirty. | Clean the read/write heads. |
| | The tape cartridge has no header/IPL file. | Install a tape with the header/IPL file. |
| | Here is a cabling fault between the Primary Processor SRU and the SRU with the cartridge tape drive used to load system programs and data. | Power the system down. Check that the cable is free of shorts, open or broken wires, and bent pins. Ensure that it is securely connected. |
| | There is a power fault. | Clear the power fault as described under Power Faults (above) and restart the load from tape. |
| | The Primary Processor SRU or SRU equipped with the cartridge tape unit used for loading system programs and data is improperly seated. | Power the system down, remove the suspected SRUs, and check each one for bent pins or other visible faults. When reinserting the SRUs, ensure that they are securely seated. Reattach the cables linking them, and restart the data load from tape |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| | | **WARNING:** Mass Storage SRUs are very heavy. |
| **M4000 TERMINAL FAULTS** | | |
| The terminal does not display the system menu on system startup. | There is a power fault. | Clear the power fault. |
| | The 25-pair cables are not connected between the LANlink SRU and the cross-connect panel. | Connect the cables. |
| | There is a LANlink fault. | Investigate the LANlink SRU. (See LANLINK FAULTS, later in this table.) |
| | There is a cabinet backplane fault. | Power the system down, remove the LANlink SRU, and clean the backplane connector. If this does not remedy the problem, replace the backplane. |
| | The M4000 terminal is faulty. | Replace the M4000 terminal. |
| | Frozen display on one M4000-series terminal. | The connector is loose.<br>Check the cable linking the LANlink SRU and the terminal. Both ends must be secure. |
| | The RS-232 Connector is faulty. | Replace the connector. |
| | The terminal has hung. | Reboot the terminal by unplugging its power cord and reconnecting it. If this does not work, replace the terminal with one that is known to be working properly. If this does not work, investigate the LANlink SRU. (See LANLINK FAULTS, later in this table.) |
| | The terminal is defective. | Replace the terminal |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| Frozen displays on all the M4000-series terminals connected to a LANlink SRU. | There is a LANlink fault. | Investigate the LANlink SRU. (See LANLINK FAULTS, later in this table.) |
| The displays on all M4000-series terminals freeze, but other system functionality continues. | There is a LANlink fault. | Investigate the LANlink SRU. (See LANLINK FAULTS, later in this table.) |
| | The Simple Forms Handler (SFH) PRU is corrupted. | Reload the SFH PRU. |
| The displays on all M4000-series terminals freeze, and other system functionality stops. | The system has hung. | Reboot the system. |
| **ASCII TERMINAL FAULTS** | | |
| An ASCII terminal connected to the system via a LAN Interface Unit (LIU) does not display the system menu on system startup. | The terminal is not receiving power. | Make sure the terminal is switched on. |
| | There is a power fault in the DNC. | Clear the power fault. (See POWER FAULTS, earlier in this table.) |
| | The terminal's internal configuration does not correspond to the definition of the LIU port it uses. | In the batch configuration file, the port is defined as an ATA port. Check that the terminal's internal configuration corresponds to the port definition in the batch configuration file. (For information on the batch configuration file, see 450-1011-301, Part 13, ‘Configuring ASCII Device Services’.) |
| | The connections to the modem are defective. | Check the connections. |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| | The modem's internal configuration is not correct for the LIU port. | In the batch configuration file, the port is defined as an ATA port. Check that the modem's internal configuration corresponds to the port definition in the batch configuration file. (For information on the batch configuration file, see 450-1011-301, Part 13, 'Configuring ASCII Device Services'.) |
| | There is a faulty modem eliminator. | Test a modem eliminator by substituting another one. |
| | There is a faulty modem. | To test a modem, substitute a local terminal with a modem eliminator. After installation, take the LIU port out of service using 'Courtesy Down', and then put it back into service. If the modem is the problem, check that it is set at the proper baud rate. Check that the LIU is properly configured, and in the 'Working' state. Reset the modem. If the problem persists, replace the modem. |
| | The 25-pair cables are not connected between the LANlink SRU and the cross-connect panel. | Connect the cables. |
| | There is a LANlink fault. | Investigate the LANlink SRU. (See LANLINK FAULTS, later in this table.) |
| | The cable connections to the LANlink line and the LIU port do not conform to the system configuration | Change the cabling to conform to the configuration. |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| | The LIU port used by the ASCII terminal is not properly defined in the batch configuration file. | Ensure that the LIU port used by the ASCII terminal is defined as an ATA port in the batch configuration file. (For information on the batch configuration file, see 450-1011-301, Part 13, 'Configuring ASCII Device Services'.) |
| | The LIU does not conform to the system map. | Sign on as a System Administrator and check that the LIU software location in the system map matches the physical location. Correct any discrepancy. |
| | The LIU is not in the 'Working' state. | Take the LIU out of service using 'Courtesy Down'. Then power down the LIU, wait 10 s, power the LIU up again, and use the Maintenance Service to put the LIU back into service.<br><br>If the LIU is properly configured, and if this procedure fails to make it operational, contact NT field support. |
| | The LIU port is not in the Working' state. | Take the LIU port out of service using 'Courtesy Down', and then put it back into service using 'Put into Service'. Check that the port goes into the 'Working' state. |
| | There is a defect in the LIU. | Take the LIU out of service using 'Courtesy Down', and run a diagnostic test on it using 'Diagnose'. If it fails the test, and if you find no evidence of any of the other probable causes, then replace the LIU. |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| **PRINTER FAULTS** | | |
| The Log printer or the Reports printer is not working. | The printer is off line. | Put the printer on line. |
| | There is a paper fault: check for a paper jam or an out-of-paper condition. | Clear the paper jam or insert paper, as required. |
| | The printer needs to be reset. | Power the printer down, and then power it up again. Then put it on line. Ensure that the printger is assigned to the desired printer queue. Check the printer queues for the print job. (For details, see 450-1011-301, Part 14, 'Printer Administration'.) If the printer is still not reset, power down the LIU and power it up again. If you cannot put the printer on line, consult the printer manuals, or contact NT field support. |
| | The printer is not configured properly. | Check the printer's settings. (Some printers have switches that must be set; some must be programmed. For details, see 450-1011-301, Part 14, 'Printer Administration'.) |
| | The printer cable is faulty. | Check that the cable is connected, and that none of the pins is bent. |
| | The appropriate print queue has not been assigned to this printer. | Check the printer queue assignments. For details, see 450-1011-301, Part 14, 'Printer Administration'. |
| | There is a LANlink fault. | Investigate the LANlink SRU. (See LANLINK FAULTS, later in this table.) |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| | The cable connections to the LANlink line and the LIU port do not conform to the system configuration. | Change the cabling to conform to the configuration. |
| | The LIU does not conform to the system map. | Sign on as a System Administrator and check that the LIU software location in the system map matches the physical location. Correct any discrepancy. |
| | The LIU is not in the 'Working' state. | Take the LIU out of service, using 'Courtesy Down'. Then power down the LIU, and power it up again. Then put the LIU back into service.<br><br>If the LIU is properly configured, and if this procedure fails to make it operational, contact NT field support. |
| | There is a defect in the LIU. | Take the LIU out of service using 'Courtesy Down', and run a diagnostic test on it using 'Diagnose'. If it fails the test, and if you find no evidence of any of the other probable causes, then replace the LIU. |
| **LANLINK FAULTS** | | |
| | The LANlink SRU is not seated properly. | Power the system down and reseat the LANlink SRU. |
| | The LANlink is not in the 'Working' state. | Take the LANlink out of service, using the 'Courtesy Down' function of SAS, and put it back into service.<br><br>***Note:*** You cannot 'courtesy down' your own terminal port or the LANlink SRU to which it belongs |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| | The LANlink does not conform to the system map. | Sign on as a System Administrator and check that the LANlink SRU's location in the system map matches the physical location. Correct any discrepancy. |
| | There is a defect in the LANlink SRU. | Take the LANlink SRU out of service using 'Courtesy Down', and run a test on it. If it is defective, power the system down and replace it. |
| **APPLICATIONS PROCESSOR FAULTS AND PRU FAULTS** | | |
| One of the system's features does not work. | The Applications Processor SRU in which the software resides is not properly seated. | Power the system down and reseat the SRU. |
| | The Applications Processor SRU is not in the "Working' state. | Take the SRU out of service using 'Courtesy Down', and put it back into service. |
| | The Applications Processor SRU is defective. | Courtesy down the SRU, power the system down, replace the SRU, power the system up, and put the new SRU into service. Wait for all PRUs on that SRU to attain the 'Working' state. (It may take up to five minutes to go from 'Loading' to 'Working'.) |
| | The PRU is improperly configured. | Check that there is an Applications Processor inserted in the slot that is listed in the system map as the PRU's address. If not, correct the discrepancy. (Power the system down before removing or inserting any SRUs.) |
| | The PRU is defective. | To check whether the PRU is defective, take it out of service using 'Courtesy Down', then put it back into service using 'Courtesy Up'. If it does not attain the 'Working' state, contact NT field support. |

**Table 3-A Continued**
**Summary of Fault Symptoms and Potential Solutions**

| SYMPTOMS | PROBABLE CAUSES | CORRECTIVE ACTIONS |
|---|---|---|
| | | Normally, the PRU goes from the 'Preload' state to 'Loading', and then to 'Working'. If the PRU goes quickly from 'Preload' to 'Faulty', it cannot find software that it requires to operate.<br><br>If a PRU goes out of service repeatedly, contact NT field support. |

## Accessing the Maintenance Service in SAS

Detailed information on the Maintenance Service is provided in the Guide to System Administrative Services, 450-1011-301. You can enlist the assistance of the system administrator when identifying faults.

Alternatively, you can request access to System Administrative Services so that you can perform the troubleshooting procedures yourself. In this case, you should use 450-1011-301 as a guide. However, you may use the following procedure as a short-form guide to the SAS Maintenance Service.

(1) At the system administrator's terminal, type the system administrator's ID and press ENTER. (This step assumes that you have arranged with the system administrator for access to System Administrative Services.) You will be prompted for a password.

(2) Type the system administrator's password. If the password is correct, the Main Menu will be displayed.

(3) Use the cursor control keys to move the cursor to System Administrative Services. If System Administrative Services is not displayed on the first page of the Main Menu, press <Next Page> to page forward to the appropriate screen.

(4) With the cursor highlighting System Administrative Services, press ENTER. The menu of System Administrative Services is displayed.

(5) Again using the cursor control keys, select Maintenance from the SAS menu, then press ENTER. The Faulty Units screen of the Maintenance Service is displayed.

The Faulty Units screen shows only those devices that the system's self-diagnostics have determined to be faulty. These may include shared resource units (SRUs), remote resource units (RRUs), and program resource units (PRUs). This screen is shown first on entering the Maintenance Service to provide a summary list of faulty units that the system has taken out of service.

The information displayed identifies the unit by its communications address, type, and name. It also shows its status and, if a PRU, its software revision number. If there are no faulty units, the display is blank.

A <Next Page> softkey is displayed if the list of faulty units occupies more than one screen.

(6) At this point, you have several possible courses of action, depending on what type of faults are listed and how you must resolve them. For example, you might want to access more information about a particular fault. In such a case, you would select the unit with the cursor control keys and proceed as follows:

(a) Press <Item Details>. This action presents a new screen showing detailed information about the unit and its fault, including how many faults it has had in the past 24 hours. Also important is the notation of any alternative units, that is, another unit that can perform this unit's functions if it is taken out of service.

(b) To return to the Faulty Units screen, press <Return> at the Item Details screen.

(7) Having identified an alternative unit via the Item Details screen, you may want to check the operating status of that unit. Also, you may want to check the status of other units in the same cabinet, or of units that may be affected if the unit is taken out of service. To do so, press <Cabinet State>.

When you press <Cabinet State>, you are displaying the first of a series of screens that are designed to show you the status of all SRUs, PRUs, and RRUs in the system. The first screen displayed is a list of all SRUs (excluding the Power Supply SRUs) in cabinet 1. Cabinet 1 is the left-most cabinet of the system as viewed from the front. (The status of PRUs and RRUs are detailed at lower levels in the screen hierarchy.)

Each SRU in the list has one of the following statuses:

- **Working:** The unit is operating properly.
- **Trouble:** The unit has an operating fault but it has not yet been taken out of service.
- **Faulty:** The unit has an operating fault and has been taken out of service by the system.
- **Down:** The unit has been taken out of service by the system administrator.
- **Unloading:** The unit is being taken out of service.
- **Preload:** This applies to processor SRUs only. PRUs are about to be loaded from disk into a processor SRU.
- **Loading:** This applies to processor SRUs only. PRUs are being loaded from disk into a processor SRU.
- **Offline:** This applies to LIUs only. The port is functional, but no connection has been made.

(8) To check the status of SRUs in cabinet 2, press <Next Cabinet>. You can page forwards and backwards through the cabinets using <Next Cabinet> and <Previous Cabinet>.

(9) From any of the Cabinet screen displays, you can move to a lower level in the screen hierarchy to view the status of each PRU in a selected processor SRU, or the equipment connected to each port of a LANlink SRU. To move to the lower level, select the appropriate SRU, and then press <Next Level>.

***Note:*** The Site Records (450-1011-152) show the assignments of Meridian M4000 terminals, personal computers, and LAN Interface Units (LIUs) to the LANlink SRU ports, and the assignment of PRUs to the processors.

(10) At any level in the hierarchy, you can access details of a selected item by pressing <Item Details>.

Several other softkeys are also provided throughout the Maintenance Service. To access these softkeys, press <More Softkeys>:

- <Courtesy Down> is used to take the unit out of service. It provides two further softkeys, <Down Only>, which takes the unit out of service, and <Down and Switch>, which takes the unit out of service and switches the function to another, predesignated SRU. If the unit has a status of 'Faulty', it is already out of service.
- <Put Into Service> puts the unit back into service. This command is typically entered after some corrective action has been taken. If the unit still has a fault, its status will register as 'Trouble' or 'Faulty'.
- <Diagnose> causes the system to run a diagnostic for the selected unit. The test will take the unit out of service. At the end of the test, the status will register 'Test OK' or 'Faulty'. If 'Test OK' is displayed, you can put the unit back into service. (If the device does not have diagnostic capabilities, a message to that effect appears on the screen.)

(11) To leave the Maintenance Service, press the <Exit> softkeys until you arrive at the System Administrative Services Main Menu.

# 4. Replacing Cabinet Subassemblies

Equipment installation and removal instructions are provided in detail in the Installation Guide for Cabinet Systems, 450-1011-201. However, exceptions are cabinet subassemblies, such as the fans and filter doors. These subassemblies should be removed only under the terms and conditions of your maintenance agreement with your supplier.

## Removing a Fan Assembly

If you have determined that a fan is defective, remove it and return it to the repair depot according to the terms of your maintenance agreement. You should take the SRUs in the affected cabinet out of service or not operate the system if a fan or fans in a cabinet are inoperable. A failed fan can result in overheating and damage to equipment.

**TOOLS:**

1 5/64-inch Allen wrench

1 1/4-inch nutdriver

1 Flat-blade screwdriver.

To remove a fan, proceed as follows:

> **- WARNING -**
> For your protection and the protection of the equipment, make sure the system is powered off for this procedure.

(1) Open the rear door of the cabinet and use a 5/16-inch Allen wrench to remove the hinge plate from the bottom of the door as shown in Fig. 4-1.

(2) Remove the fan grill at the top of the cabinet by taking out the screw with a 1/4-inch nutdriver.

(3) With the 1/4-inch nutdriver, remove the two hex screws that hold the top of the fan grill's mounting bracket as shown in Fig. 4-1.

(4) Disconnect the receptacle on the fan power cable from the plug on the fan assembly.

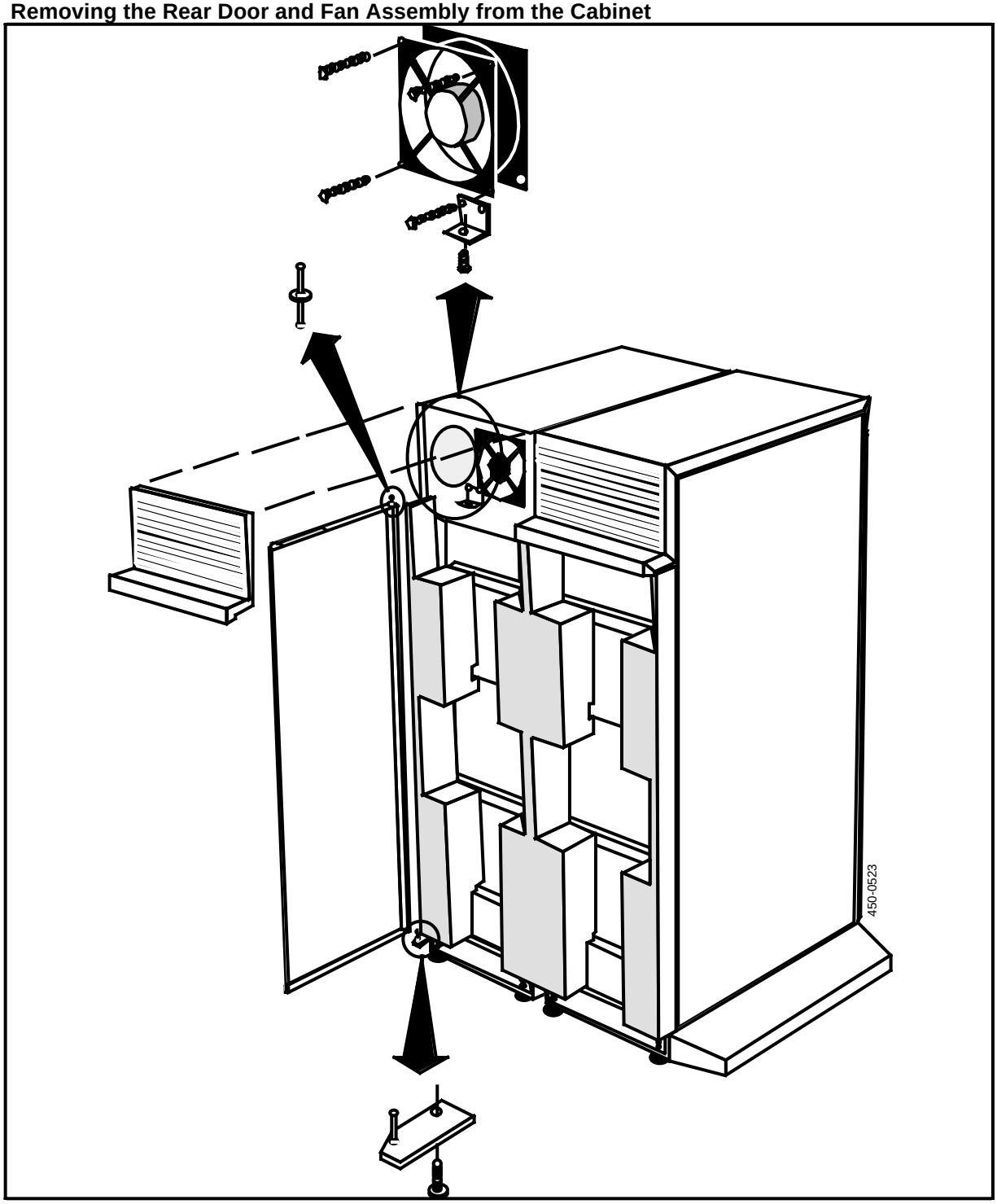
(5) Remove the three remaining screws on the fan with the 1/4-inch nutdriver.

(6) Remove the fan assembly from the cabinet and disconnect the ground wire from the fan with a flat-blade screwdriver.

(7) If a replacement fan assembly is available, install it according to the procedure titled ‘Installing the Fan Assembly’. Check the part number to ensure they are the same model of unit. If no spare is available, wrap up the door's hardware and store it with the door in a safe place until a replacement fan is available.

(8) Pack the defective fan carefully in bubble wrap and a cardboard carton and return it to the repair depot.

**Figure 4-1**
**Removing the Rear Door and Fan Assembly from the Cabinet**



## Installing the Fan Assembly

To keep the system operational while a faulty fan unit is being repaired, you should install a spare. When the faulty fan is returned from the repair depot, it should be stored as the spare. Ensure that the replacement unit has the same part number as the unit being replaced.

This procedure assumes that the door assembly has been removed and not yet reinstalled. To replace the fan assembly, proceed as follows:

> **- WARNING -**
> For your protection and the protection of the equipment, make sure the system is powered off for this procedure.

(1) Connect the ground wire from the metal rear panel on the cabinet to the fan as shown in Fig. 4-1. Use the screw removed in Step 6 of 'Removing the Fan Assembly' and the 1/4-inch nutdriver.

(2) Align the screw holes on the fan assembly with those on the rear panel.

> **- CAUTION -**
> When connecting the fan assembly to the cabinet, ensure that you tighten the screws equally or the assembly may flex and contact the fan blade.

(3) Using the 1/4-inch nutdriver, insert a hexagonal screw in each of the upper corners of the fan assembly and in the lower corner nearest the side of the cabinet.

(4) Connect the receptacle on the fan power cable to the plug on the fan assembly.

(5) Reinstall the fan grill mounting bracket on the fan units with the two remaining 1/4-inch hexagonal screws.

(6) Insert the pin of the hinge plate into the hole at the base of the door.

(7) Fasten the hinge plate to the bottom of the cabinet using the 5/64-inch Allen wrench.

(8) Insert the hinge pin into the hole at the top of the rear door.

(9) Maneuver the top of the door and the fan grill cover so that the top hinge pin is inserted into the hole in the fan grill cover, then push the door and fan grill cover into position.

(10) Tighten the 1/4-inch hexagonal screw on the fan grill mounting bracket.

(11) Verify that the door opens and closes smoothly. If not, loosen the fan grill mounting bracket and move it slightly forward or backward to adjust the door.

## Replacing the Filter Door

With proper handling when cleaning or replacing the cabinet filter, the fan filter door at the bottom of the cabinet should not be damaged. However, should you accidentally damage it, it can be easily replaced.

**TOOLS:**

1 Flat-blade screwdriver.

To remove the filter door, proceed as follows:

> ***Note:*** There are two types of filter doors, which cannot be interchanged. The following procedure applies to both models, but make sure the part number of the replacement matches the one being removed. These codes are marked on the filter doors.

(1) Open the front door of the cabinet.

(2) Open the filter door by pressing down the latches and lowering the door as shown in Fig. 4-2.

(3) Insert the blade of a flat-blade screwdriver between the hinge plate on the side of the filter door and the base of the cabinet.

(4) To free the door, force the pin on the hinge plate out of the hole in the cabinet base.

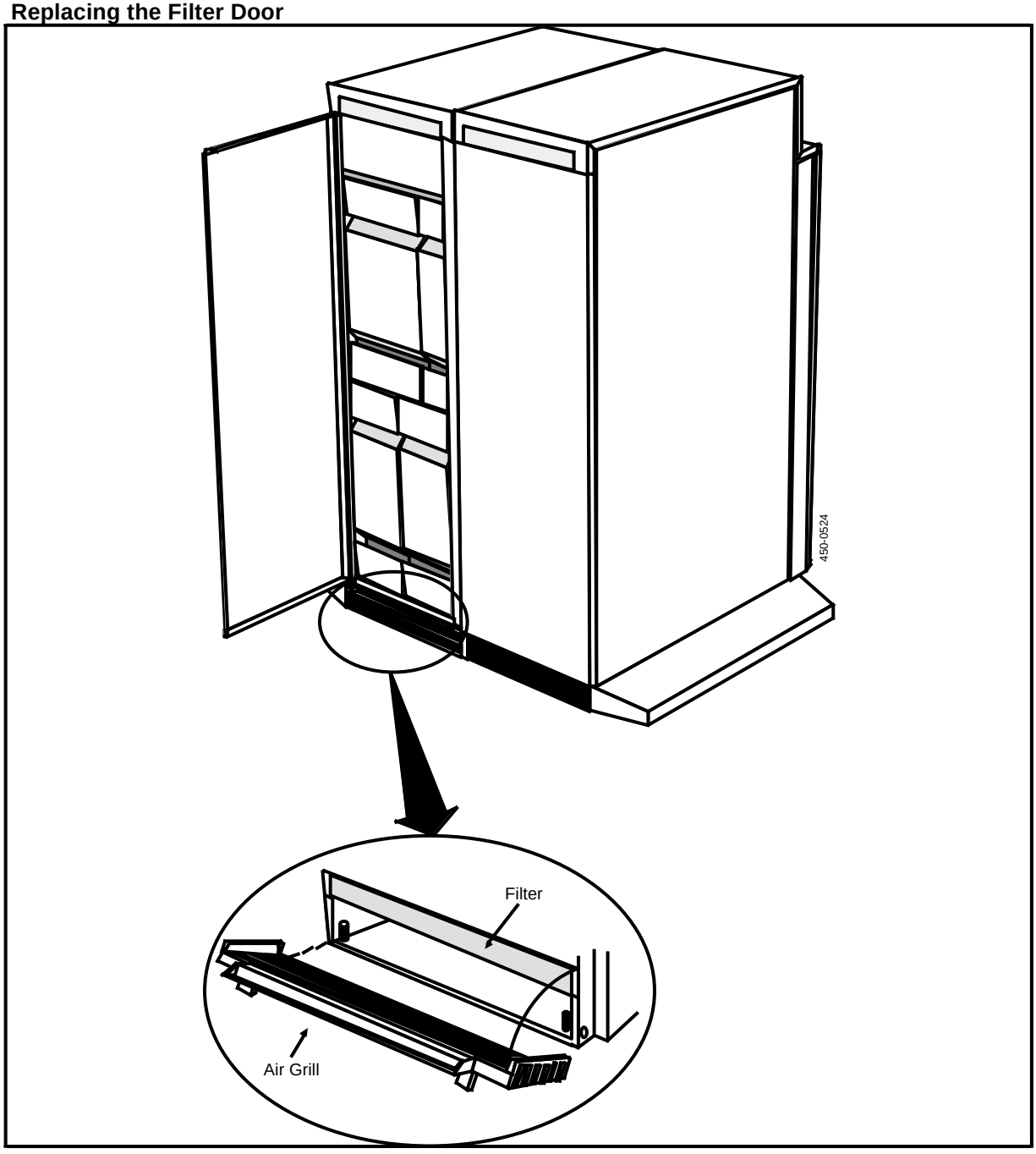
To replace the filter door, proceed as follows:

(1) Insert the hinge pin in the hole inside the cabinet base.

(2) With the flat-blade screwdriver, bend the other plastic hinge plate until the pin clears the base of the cabinet and enters the hole.

(3) Close the filter and cabinet doors.

**Figure 4-2**
**Replacing the Filter Door**



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