

**8560 Series
Multi-User Software
Development
Unit**

TNIX

8560 Series System Manager's Operation Guide

TNIX Version 2.1

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at the rear of this manual*

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GUIDE TO DOCUMENTATION

This page shows the manuals you are most likely to use with your 8560 Series system. We recommend that you acquaint yourself with each of these manuals. (You probably won't read any manual all the way through, but we do suggest that you acquire a general idea of which information is contained in which manual.) Section 1 of each manual contains pointers to the rest of the information in the manual.

This manual explains TNIX, the operating system of your 8560 Series system, and describes standard 8560 Series features.

**8560 Series MUSDU
System Users Manual**

This manual tells how to unpack and install the 8560 Series system. It also explains the operations to be done by the system manager—the person responsible for connecting 8540s and 8550s and maintaining accounts, software, and other aspects of a multi-user system.

**8560 Series System
Manager's Operation Guide**

**8560 Series Hardware
Installation Guide**

The TNIX operating system contains an online "manual page" of information about commands. You can show the information on the terminal screen, or print it on your printer.

**8560 Series
Online Documentation**

This optional accessory manual contains printed versions of the online manual pages for standard TNIX commands. You may want to order this manual if you find yourself printing many of the online manual pages.

**8560 Series MUSDU
System Reference Manual**

In addition to the above documentation, you may also be using manuals for other 8500 Series instruments (8540s and 8550s) or software products. The *Learning Guide* of the *8560 Series System Users Manual* contains a list of user manuals for many products used with 8560 Series systems.

PREFACE

ABOUT THIS MANUAL

This *8560 Series System Manager's Operation and Installation Guide* package consists of two parts:

- An 8560 Series System Manager's Operation Guide, Sections 1 through 3, which shows how to perform system maintenance activities, such as creating user accounts, installing software, and verifying disk integrity;
- An 8560 Series Hardware Installation Guide, Sections 4 through 7, and Appendixes A through C, which provides first-time installation and power-up information.

NOTE

Unless otherwise specified, all references to the TEKTRONIX 8560 Multi-User Software Development Unit (MUSDU) include the 8560 (SN B100000 and above), the 8561 (SN B100000 and above), and the 8562.

The 8560 MUSDU should be installed by a Tektronix field service specialist. Tektronix, Inc. is not obligated to repair damage caused by unauthorized individuals to install this equipment. Please contact your nearest Tektronix field service office for installation and additional information.

This manual is one of several sources of information about your 8560:

- A companion volume, the *8560 Series MUSDU System Users Manual TNIX Version 2* is your guide to using the 8560 Series Multi-User Software Development Units. This manual provides an overview of the 8560 system, as well as detailed information about the TNIX operating system and all standard 8560 features.
- The optional *8560 Series MUSDU System Reference Manual TNIX Version 2* contains a detailed description of each TNIX command. Online information about TNIX commands and other topics is also available.
- The optional *8560/8561/8562 Service Manual* contains servicing instructions for your 8560 Series MUSDU. Only qualified service personnel should service this equipment.

This *8560 Series System Manager's Operation and Installation Guide* is organized as follows:

Section 1. Common System Operations. This section provides a brief overview of your responsibilities as system manager. This section also describes procedures that the system manager should perform on a daily or an occasional basis.

Section 2. Attaching Terminals, 8540s, 8550s, and Printers. This section shows how to connect terminals, 8540 and 8550 workstations, and line printers to the 8560.

Section 3. System Maintenance Commands. This section provides full documentation of the commands used in certain system maintenance activities when online information is not accessible.

Section 4. Installation Overview. This section provides a flowchart to guide you through first-time installation of the 8560 system. This section also contains a brief functional description of the 8560.

Section 5. Site Preparation and Unpacking. This section provides instructions on space and power requirements for the 8560 and tells how to unpack the 8560.

Section 6. 8560 Board Configuration. This section provides information about the various jumpers and straps located on 8560 circuit boards.

Section 7. Preparation for Operation. This section tells how to power up your system and how to verify system operation with one terminal.

Appendix A. Controls, Connectors, and Indicators.

Appendix B. Specifications.

Appendix C. Interface Signal Connections.

Index.

PRODUCTS SUPPORTED

This manual supports the 8560 (Sn B100000 and up), the 8561 (SN B100000 and up), and the 8562 Multi-User Software Development Units. The following table summarizes the differences between these products.

| System Components | 8561 SN B100000 and up | 8560 SN B100000 and up | 8562 |
|--|--|--|--|
| Microprocessor | LSI-11/23 (LSI-11/73 optional upgrade) | LSI-11/23 (LSI-11/73 optional upgrade) | LSI-11/73 |
| Internal disk mass storage capacity | 15M bytes (55M bytes with optional upgrade 40M-byte disk) | 40M bytes (80M bytes with optional upgrade 40M-byte disk) | 40M bytes (80M bytes with optional upgrade 40M-byte disk) |
| External disk(s) mass storage capacity | Up to 2 external disks | Up to 2 external disks | Up to 2 external disks |
| System memory | 256K bytes (up to 1M bytes optional upgrade) | 256K bytes (up to 1M bytes optional upgrade) | 1M bytes |
| Disk Controller | MSC | MSC | MSC |
| Number of users supported | 2 (4 or 8 optional) | 4 (8 optional) | 8 |

NOTE

Internal disk mass storage capacity, as specified in this manual, refers to the approximate formatted disk size.

In this manual, any references to an 8560 apply equally to the 8561 and the 8562, with the following exceptions:

- Wherever hard-disk storage capacity is discussed, keep in mind that the 8561 has a capacity of 15M bytes, while the 8560 and 8562 have a capacity of 40M bytes.
- The standard version of the 8561 supports a maximum of two users. The standard version of the 8560 supports four users, while the standard version of the 8562 supports eight users.
- Any reference to a second IOP Board applies to the 8562, and to all 8560 and 8561 units that include the eight-user option.

NOTE

The term LSI-11, as used in this manual, will refer to the LSI-11/23 and the LSI-11/73. The terms LSI-11/23, LSI-11/73, and DEC are registered trademarks of the Digital Equipment Corporation, Maynard, Massachusetts.

CHANGE INFORMATION

Change pages are issued by Tektronix, Inc., to document changes to the manual after it has been published. Change information is located at the back of this manual, following the yellow tab marked "CHANGE INFORMATION." When you receive the manual, you should enter any change information into the body of the manual, according to instructions on the change notice.

REVISION HISTORY

As this manual is revised and reprinted, revision history information is included on the text and diagram pages. Existing pages of manuals that have been revised are indicated by REV and a date (REV OCT 1984) at the bottom inside corner of the page. New pages added to an existing section, whether they contain old, new, or revised information, contain the word "ADD" along with the revision date (ADD OCT 1984).

CONTENTS

| | Page |
|---|------|
| Operators Safety Summary | ix |
| Servicing Safety Summary | ix |
| Section 1 COMMON SYSTEM OPERATIONS | |
| Introduction | 1-1 |
| Starting Up and Shutting Down the System | 1-4 |
| Occasional Operations | 1-12 |
| Creating and Restoring System Backups | 1-17 |
| Recovering from a System Crash | 1-29 |
| Section 2 ADDING TERMINALS, 8540s, 8550s, AND PRINTERS | |
| Introduction | 2-1 |
| Configuring a Port | 2-1 |
| Connecting a Terminal | 2-4 |
| Connecting an 8540 Integration Unit | 2-4 |
| Connecting an 8550 MDL | 2-8 |
| Connecting and Configuring a Line Printer | 2-11 |
| Section 3 SYSTEM MAINTENANCE COMMANDS | |
| Introduction | 3-1 |
| Notational Conventions | 3-2 |
| cvt | 3-3 |
| dump | 3-8 |
| format | 3-11 |
| mkboot | 3-13 |
| mkfs | 3-14 |
| restor | 3-18 |
| syschk | 3-21 |
| Messages | 3-22 |
| Section 4 INSTALLATION OVERVIEW | |
| Introduction | 4-1 |
| First-Time Installation (Basic System) | 4-1 |
| What is an 8560? | 4-5 |

WARNING

The following servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing other than that contained in operating instructions unless you are qualified to do so.

| | Page |
|--|------|
| Section 5 SITE PREPARATION AND UNPACKING | |
| Introduction | 5-1 |
| Site Preparation | 5-1 |
| Unpacking the 8560 | 5-7 |
| Storing and Reshipping the 8560 | 5-15 |
| Section 6 8560 BOARD CONFIGURATION | |
| Introduction | 6-1 |
| Jumpers and Straps | 6-1 |
| LSI-11/23 Processor | 6-2 |
| LSI-11/73 Processor | 6-3 |
| 256K and 512K Memory Boards | 6-4 |
| MSC Board | 6-8 |
| Xebec S1410 Disk Controller | 6-9 |
| QumeTrak 242 Flexible Disk Drive | 6-10 |
| Seagate ST419 Hard Disk Drive | 6-11 |
| Micropolis 1304 Hard Disk Drive | 6-12 |
| Utility Board | 6-13 |
| I/O Processor Board | 6-15 |
| I/O Boards | 6-17 |
| Section 7 PREPARATION FOR OPERATION | |
| Introduction | 7-1 |
| Installing the System Terminal | 7-1 |
| System Verification | 7-3 |
| Reconfiguring TNIX for Additional Users | 7-7 |
| Appendix A CONTROLS, CONNECTORS, AND INDICATORS | |
| Front Panel Controls and Indicators | A-1 |
| Rear Panel Controls and Connectors | A-2 |
| Appendix B SPECIFICATIONS | |
| Characteristics | B-1 |
| Port Specifications | B-2 |
| Appendix C INTERFACE SIGNAL CONNECTIONS | |
| Appendix D INDEX | |

OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as you read the marking, or a hazard to property including the equipment itself.


DANGER indicates a personal injury hazard immediately accessible as you read the marking.

SYMBOLS

As Marked on Equipment

 **DANGER** high voltage.

 Protective ground (earth) terminal.

 **ATTENTION** - Refer to manual.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

(Refer also to the preceding Operators Safety Summary)

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

SAFETY PRECAUTIONS

Grounding the Product

This product is grounded through the grounding conductor in the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the equipment's power input terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

- Use only the power cord and connector specified for your product.
- Use only a power cord that is in good condition.
- Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product. Be sure the fuse is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

The product is designed to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Section 1

COMMON SYSTEM OPERATIONS

| | Page |
|---|------|
| Introduction | 1-1 |
| Notational Conventions | 1-2 |
| The Root Account | 1-3 |
| The Root and Non-Root Filesystems | 1-3 |
| | |
| Starting Up and Shutting Down the System | 1-4 |
| How to Start Up the System | 1-4 |
| How to Set the Time and Date | 1-6 |
| How to Reboot the System From the Fixed Disk | 1-6 |
| How to Boot the System From the Standalone Utilities Disk | 1-6 |
| How to Shut Down the System | 1-7 |
| How to Change the System's Operating Mode | 1-8 |
| Multi-User Mode | 1-10 |
| Standalone Mode | 1-10 |
| Single-User Mode | 1-11 |
| | |
| Occasional Operations | 1-12 |
| How to Install New Software | 1-12 |
| How to Create a Group | 1-12 |
| How to Assign a User to a Group | 1-13 |
| How to List the Members of Each Group | 1-13 |
| How to Create an Account for a New User | 1-13 |
| The Default Login Command File | 1-13 |
| How to Delete a User's Account | 1-13 |
| How to Obtain Information About Users | 1-14 |
| How to Assign and Modify Passwords | 1-14 |
| How to Delete a Password | 1-15 |
| How to Change the Login Message | 1-15 |
| How to Send a Message to All Users | 1-16 |
| How to Mount a Filesystem | 1-16 |
| How to Unmount a Filesystem | 1-17 |
| | |
| Creating and Restoring System Backups | 1-17 |
| How to Perform a Full Backup | 1-17 |
| How to Perform an Incremental Backup | 1-19 |
| How to Recover Selected Files from Backups | 1-21 |
| How to Reinitialize TNIX and Restore the Root Filesystem | 1-23 |
| How to Restore Backups to a Non-Root Filesystem | 1-27 |

| | Page |
|---|-------------|
| Recovering from a System Crash | 1-29 |
| Run Standalone Syschk | 1-29 |
| Check the /etc Directory Files..... | 1-29 |
| Install a New Boot Block | 1-29 |
| Problems That Can Cause a System to Crash | 1-30 |
| Obtaining a System (Core) Dump..... | 1-33 |

ILLUSTRATIONS

| Fig. No. | | Page |
|---------------------|---|-------------|
| 1-1 | Booting the system..... | 1-4 |
| 1-2 | Shutting down/powering down the system..... | 1-7 |
| 1-3 | Entering and exiting the three system operating modes | 1-9 |
| 1-4 | The countdown shell command file..... | 1-16 |
| 1-5 | An algorithm for performing incremental backups | 1-20 |
| 1-6 | An algorithm for restoring incremental backups..... | 1-26 |

TABLES

| Table No. | | Page |
|----------------------|---------------------------------------|-------------|
| 1-1 | The 8560's Three Operating Modes..... | 1-8 |

Section 1

COMMON SYSTEM OPERATIONS

INTRODUCTION

For any multi-user system, it's generally most efficient to designate a "system manager" who is responsible for operational tasks, such as installing software, creating user accounts, and backing up the system. This section describes the tasks that an 8560 system manager needs to perform and tells how to perform them.



NOTE

Before you can perform any of the operations described in this section, your system must be installed and verified by qualified service personnel. Information on first-time installation is provided in Sections 4 through 7 of this manual.

This section describes the procedures that the system manager should perform on a daily or occasional basis. This section does not tell how the TNIX operating system works; it only describes the procedures necessary to keep TNIX functioning properly. For general information on the TNIX operating system, refer to your *8560 Series System Users Manual*.

This section first describes the root account—the special login account you must use to perform many of the system manager tasks described in this section. The first part of this section also explains the differences between the root and non-root filesystems. The rest of Section 1 consists of procedures that show you how to:

- Start up the system, reboot the system from the fixed disk and from the Standalone Utilities Disk, and shut down the system
- Set the time and date
- Install new software and software upgrades
- Create a group
- List the members of each group
- Create and delete user accounts and modify the default commands executed when a user logs in
- Obtain information about users on the system
- Assign, modify, and delete passwords
- Change the login message
- Send a message to all users
- Mount and unmount filesystems
- Back up your system and recover files from backups
- Reinitialize TNIX and restore the root filesystem from backups
- Restore backups to a non-root filesystem

To use this section effectively:

- You should be familiar with the TNIX operating system, as described in the Learning Guide and TNIX Operating System sections of your *8560 Series System Users Manual*
- Your system should have been installed by qualified personnel, as described in Sections 4 through 7 of this manual and
- Workstations and peripherals must be attached and properly configured to operate with your system, as described in Section 2 of this manual.

Notational Conventions

The examples in this section use the following notational conventions:

- Text that you type is underlined; system response displayed on your terminal is not underlined.
- Comments are enclosed in [square brackets].
- The notation <CTRL-D> tells you to simultaneously press the key marked “CTRL” (for “control”) and type a “D”.

In this section, the term “8560” refers to an 8560 (SN B100000 and above), an 8561 (SN B100000 and above), and an 8562, unless otherwise noted.

The Root Account

When you log into the root account, you'll notice that the prompt is "#", as opposed to the standard "\$" TNIX prompt. Normal TNIX file protection does not apply when you log into the root account—you can read, write, execute, and delete any file on the system.

Most of the procedures described in this section require you to log into the root account first. If you can use an account other than the root account to perform a certain procedure, do so. Use the root account only when necessary.

NOTE

*Because normal TNIX file protection does not apply to you when you log into the root account, you should be extremely careful when using the **rm** command.*

If you want to restrict access to the root account (for example, if you store sensitive information on your system), you can use the **passwd** command to set up a password for the root account. For example, to set the password to "SuperUser", type:

```
# passwd
New password: SuperUser      [ typed but not echoed ]
Retype password: SuperUser   [ typed but not echoed ]
```

The Root and Non-Root Filesystems

The root filesystem is a set of data located on the 8560's internal disk. If you have one or more hard disks attached to your 8560, the root filesystem may extend over one or more of these units. The logical device names that the root filesystem can be assigned to include */dev/rhd0*, */dev/rhd01*, */dev/rhd02*, and */dev/rhd03*. The "/" directory is the top, or "root", directory of the root filesystem.

A non-root filesystem is a collection of data stored on one or more physical devices excluding the 8560's internal disk. To access data on a non-root filesystem, you must mount that filesystem with the **mount** command. This command assigns a specific directory in the root filesystem, such as */usr1*, as the "root" directory for the non-root filesystem. After a non-root filesystem is mounted, data on the filesystem can be accessed by specifying the data's full pathname. This pathname must start with the "root" directory for that filesystem (in this case, */usr1*).

NOTE

*Files cannot be linked with the **ln** command across filesystems.*

STARTING UP AND SHUTTING DOWN THE SYSTEM

The following procedures describe how to start up and shut down your system.

CAUTION

To protect the integrity of your file system, do not activate the HALT or RESTART switches until you have followed the shutdown procedure, "How to Shut Down the System," later in this section.

How to Start Up the System

Figure 1-1 shows the steps required to start up the system. Each of these steps is explained following the figure.

NOTE

The following procedures assume that your system has been properly installed by qualified service personnel, as described in Sections 4 through 7 of this manual.

To start up your system, perform the following steps as shown in Fig. 1-1:

1. Open the flexible disk drive's door.
2. Power up all peripherals you plan to use with the system, for example:
 - The system terminal
 - Modems
 - Line printers (make sure each printer is online before using it)

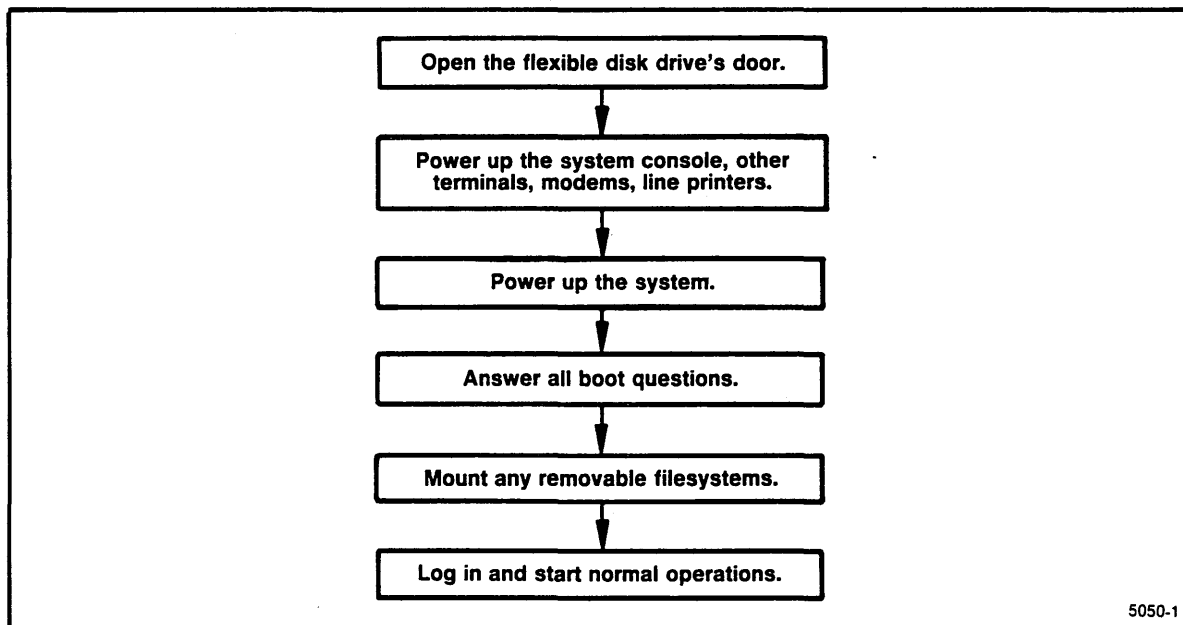


Fig. 1-1. Booting the system.

3. Power up the system:

- Make sure the POWER switch on the 8560's rear panel is in the ON position.
- Move the RUN/HALT switch on the 8560's front panel to the RUN position.
- Move the DC switch on the 8560's front panel to the ON position. The green light next to the DC switch should go on, and the internal hard disk(s) should start running.

4. The system automatically boots when you first power it up. Within one minute after you move the DC switch to the ON position, the system terminal displays the message

```
Welcome to TNIX Version X.X on an ll/XX
```

This message tells you what version of TNIX is installed on your system, which CPU is installed in your system, and that the system has started the boot procedure.

5. Answer any question the system asks you during the boot procedure, for example:

```
Do you want to check the filesystem at this time?
Enter y for yes, n for no, or question mark for more information: y
    [ syschk prints the following if you type a "y": ]
checking /dev/rhd0:
    ...checking i-nodes and directory entries...
    ...checking tree structure...
    ...checking free list...
free list is ok.  rebuild free list? (y or n): n
0 bad blocks (0 percent)
52920 free blocks (84 percent)
19916 free i-nodes (95 percent)
.
.
.
Please enter the correct date: 15-apr-84 13:55
Fri Apr 15 13:55:00 PDT 1984

Do you want to remain single user?
Enter y for yes, n for no, or question mark for more information: n
.
.
.
```

If **syschk** reports that the filesystem has problems, you will have to shut down the system and run the Standalone version of the **syschk** program. The system must be in standalone mode in order to use **syschk** to modify or repair the root filesystem. For additional information, refer to the procedures "How to Shut Down the System" and "Recovering from a System Crash," later in this section.

6. Use the **mount** command to mount any filesystems on the additional disks if you are using more than one hard disk with your system. (You can skip this step if you have placed the appropriate **mount** commands in the */etc/rc* file.) For further information, see the procedure "How to Mount a Filesystem," later in this section.

7. Log in and start normal operations:

```
login: root          [ Log into the root account. ]
Password:             [ The password is typed but not echoed. If there is
                        no password, you will not be asked for a password. ]
```

The system is now ready for normal operations.

How to Set the Time and Date

Use the **date** command to set the system time and date or to find out what the current time and date is. For example:

```
# date
Mon May 2 22:30:00 PDT 1984
```

The following command changes the current date, but not the time:

```
# date 3-may-84
Tue May 3 22:30:00 PDT 1984
```

The following command changes the current time, but not the date:

```
# date 22:35
Mon May 2 22:35:00 PDT 1984
```

The following command changes the current date and time:

```
# date 3-may-1984 22:35
Tue May 3 22:35:00 PDT 1984
```

How to Reboot the System From the Fixed Disk

You should reboot the system from the fixed disk after installing new software on your system, after running the system in standalone mode, or after modifying any system parameters with the **cvt** command.

Perform the following steps to reboot the system from the fixed disk:

1. Make sure that the flexible disk drive's door is open.
2. Shut down your system if it is running. The discussion entitled, "How to Shut Down the System" explains the shutdown command.
3. Move the RUN/HALT switch to the RUN position.
4. Toggle the RESTART switch.

How to Boot the System From the Standalone Utilities Disk

Boot the system from the Standalone Utilities Disk whenever you want to operate the system in standalone mode.

Perform the following steps to boot the system from the Standalone Utilities Disk:

1. Insert the Standalone Utilities Disk into the flexible disk drive and close the drive's door.
2. Shut down the system if it is running. The following discussion explains the **shutdown** command.
3. Move the RUN/HALT switch to the RUN position.
4. Toggle the RESTART switch.

How to Shut Down the System

Figure 1-2 shows the steps required to shut down the system. Each of these steps is explained following the figure.

When you are ready to shut down your system, perform the following steps shown in Fig. 1-2:

1. Log into the root account on the system terminal:

```
login: root
Password:      [ enter your root account password, if necessary. ]
```

2. Make sure that all other users have logged out. Type:

```
# who
```

to see if any other users are on the system. If other users are logged in, you can use the **wall** command (*w*rite to *a*ll users) to warn them that you are planning to bring the system down. For more information, see the procedure, "How to Send a Message to All Users", later in this section.

If any users are still logged in after you have warned them that you are bringing the system down, you can log them out by typing:

```
# kill -1 1
```

This command puts the system into single-user mode.

3. Use the **umount** command to unmount each filesystem located on any additional hard disk(s) if you are using more than one hard disk unit with your system. First, use the **mount** command to determine which filesystems are mounted. For example:

```
# /etc/mount
hd2 on /usr2
```

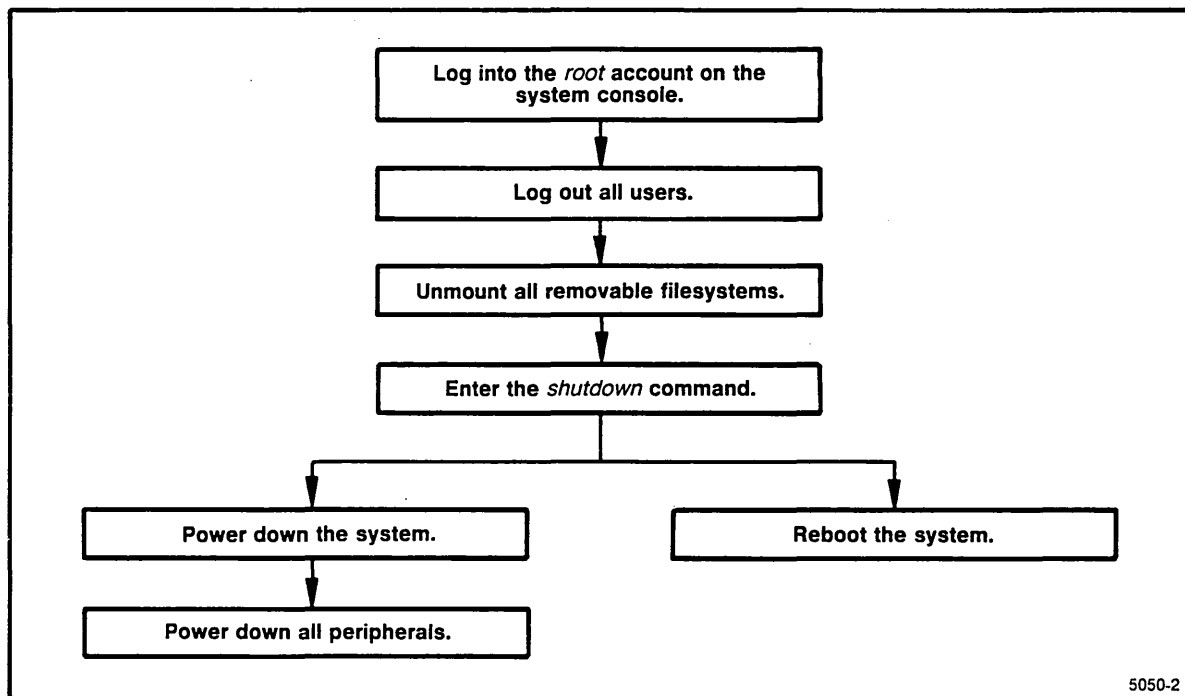


Fig. 1-2. Shutting down/powering down the system.

In this example, a removable filesystem with root directory `/usr2`, located on logical device `/dev/hd2`, is mounted on the system. You would type the following command to unmount the `/usr2` filesystem:

```
# /etc/umount /dev/hd2
```

4. Shut down the system by typing:

```
# shutdown
```

This command verifies that you (the root user) are the only user logged in, and that all pending memory-to-disk write operations are performed. Then the command shuts down the software operating system.

5. After a length of time, the system displays the message:

```
System may now be safely powered down or rebooted
```

on the system terminal. You can now power down or reboot the system. To power down the system, first move the DC switch to the OFF position. Then move the AC POWER switch to the OFF position. If necessary, power down any peripherals connected to the system.

To reboot the system, first make sure that the RUN/HALT switch is in the RUN position. To reboot from the system's internal fixed disk, ensure that the flexible disk drive's door is open and then toggle the RESTART switch. To reboot from the Standalone Utilities Disk, insert the disk into the flexible disk drive, close the drive's door, then toggle the RESTART switch.

How to Change the System's Operating Mode

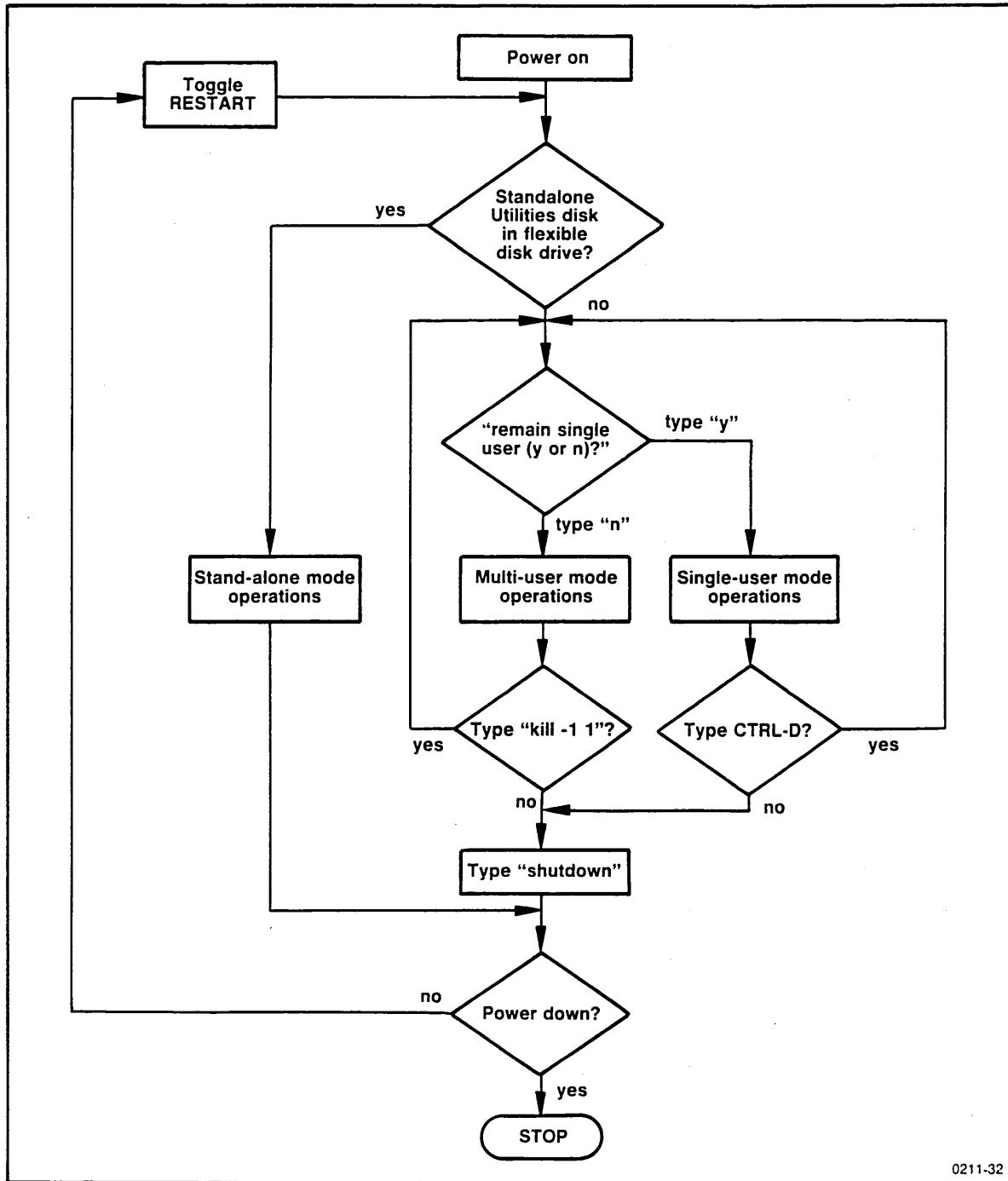
There are three basic operating modes available on the system:

- Multi-user mode
- Standalone mode
- Single-user mode

Table 1-1 summarizes information about each mode. Figure 1-3 shows how you can go from one operating mode to another. Following the figure, each operating mode is described, including an explanation of why you use each mode and how to enter a specific mode.

Table 1-1
The 8560's Three Operating Modes

| Mode | How Used |
|-------------|--|
| Multi-user | Perform most operations, install software and software upgrades, initialize TNIX for a specific hardware configuration after hardware installation, backup the root and non-root filesystems, restore data from backups to non-root filesystems, repair non-root filesystems |
| Single-user | Repair system files in the <code>/etc</code> directory, backup the root filesystem |
| Standalone | Restore data from backups to the root filesystem, repair the root filesystem, initialize TNIX for a specific hardware configuration prior to hardware installation, perform crash recovery procedures |



0211-32

Fig. 1-3. Entering and exiting the three system operating modes.

Multi-User Mode

Multi-user mode is the system's normal operating condition. You should also place the 8560 in multi-user mode when you need to install new software (or a new version of TNIX) on your system, or when you need to perform system maintenance operations on non-root filesystems. Before you put the system into multi-user mode, make sure that the flexible disk drive is empty. Figure 1-3 shows three ways to put the system into multi-user mode:

- If the system is powered down, make sure that the AC POWER switch is in the ON position. Then move the DC switch to the ON position.
- If the system is in standalone mode, toggle the RESTART switch.
- If the system is in single-user mode, type <CTRL-D>.

When the system asks if you want to remain in single-user mode, type "n" and the system will be placed in multi-user mode.

Standalone Mode

You should place the 8560 in standalone mode when you need to:

- Repair the root filesystem
- Reinitialize TNIX after certain types of hardware upgrades
- Restore the root filesystem from backups or from the Tektronix-supplied distribution disks
- Perform crash recovery operations.

Figure 1-3 shows three ways to put the system into standalone mode.

1. If the system is powered down:
 - Insert the Standalone Utilities Disk into the flexible disk drive.
 - Make sure that the AC POWER switch is in the ON position. Then move the DC switch to the ON position.
2. If the system is powered up and running in either multi-user or single-user mode:
 - Log into the root account on the system terminal.
 - Make sure that all other users are logged out. (Follow the procedure, "How to Shut Down the System," earlier in this section).
 - Shut down the system by typing:

```
# shutdown
```
 - Insert the Standalone Utilities Disk into the flexible disk drive and toggle the RESTART switch when this message appears on the system terminal:

```
System may now be safely powered down or rebooted
```
3. In the event of a system crash, insert the Standalone Utilities Disk into the flexible disk drive and toggle the RESTART switch. For additional information regarding system crash recovery, refer to the procedure entitled, "Recovering from a System Crash," later in this section.

The system is in standalone mode when the system terminal displays the following message:

```
fbr filename to boot>
```

NOTE

The system terminal port operates at 2400 baud during standalone system operation.

Single-User Mode

You should place the 8560 in single-user mode when you need to:

- Repair system files (those located in the `/etc` directory)
- Back up the root filesystem, if it is possible that another user may attempt to log into the system while you are performing the backup.

Before putting the system in single-user mode, make sure that the flexible disk drive is empty. Figure 1-3 shows three ways to put the system into single-user mode:

1. If the system is powered down, make sure that the AC POWER switch is in the ON position, then move the DC switch to the ON position.
2. If the system is in standalone mode, toggle the RESTART switch.
3. If the system is in multi-user mode:
 - Log into the root account on the system terminal.
 - Make sure that all other users are logged out. To see if any other users are logged in, type:

```
# who
```

If any other users are logged in, use the `wall` command to warn them that you are bringing the system down.
 - Log out any users still logged into the system, then put the system into single-user mode by typing:

```
# kill -1 1
```

When the system asks you if you want to remain in single-user mode, type “y”, and the system will be placed in single-user mode.

When you are finished with single-user mode operations, you can either shut down the system or put the system in multi-user mode. To put the system in multi-user mode, first type `<CTRL-D>`. Then type an “n” when the system asks if you want to remain in single-user mode.

OCCASIONAL OPERATIONS

The following procedures describe some system operations you will perform on an infrequent basis.

How to Install New Software

The following procedure shows how to install new software (or a new version of TNIX) onto your system:

1. Create a backup of your system, as described in the procedure "How to Perform an Incremental Backup," later in this section. (You do not have to repeat this step if you are installing two or more software packages at one time.)
2. Make sure that the system is in multi-user mode.
3. Log into the root account.
4. If you are installing a new version of the operating system, such as a new version of the */tnix* file, make sure you are the only person logged into your system. You can use the **who** command to see if any other users are logged in.
5. Insert volume one of the software installation disks into the flexible disk drive and close the drive's door.
6. Type the **install** command:

```
# install
```

The **install** command will guide you through the installation of the new software or a new version of TNIX.

7. Remove the software installation disk when the **install** command finishes executing.
8. If you have installed a new version of TNIX, reboot your system to load the new version of TNIX into main memory, as described in the procedure "How to Reboot the System from the Fixed Disk", earlier in this section.
9. Perform the next level incremental backup of your system, as described in the procedure "How to Perform an Incremental Backup", later in this section. (This incremental backup records all changes made to your system after the previous incremental backup that you performed in step 1 of this procedure.)

If you have just installed a new version of TNIX onto your system, replace your existing Standalone Utilities Disk with volume 1 of the installation disks. This disk is your new Standalone Utilities Disk.

How to Create a Group

You can use the **mkgroup** command to create a new group. For example, to create a group called "mc68000", type

```
# mkgroup mc68000
```

How to Assign a User to a Group

To assign a user to a group, add that user's username to the last field of that group's entry in the */etc/group* file. For example, if the entry for the *ai* group in the */etc/group* file is

```
ai:175:lazarus,arthur,richard,brian
```

and you want to add *frodo* to this group, modify the previous line so that it looks like this:

```
ai:175:lazarus,arthur,richard,brian,frodo
```

How to List the Members of Each Group

You can list all groups on the system by typing:

```
# cat /etc/group
```

The following command lists all users who belong to the "hobbits" group:

```
# grep '^hobbits' /etc/group
```

How to Create an Account for a New User

Each TNIX user needs an account. To create a new account, log in as *root* and use the **mkuser** command. For example, to create a new user account, type:

```
# mkuser lazarus Z80 hyperion
```

This command creates an account for *lazarus*, assigning him to groups "Z80" and "hyperion."

The Default Login Command File

A default login command file, *usr/lib/default.profile*, is installed for each user by the **mkuser** command. This command file is copied to the *.profile* file in the user's login directory. The login directory contains commands executed by the TNIX shell each time a user logs in.

How to Delete a User's Account

To delete a user's account from the system, perform the following steps:

1. Make sure that the user is not logged into the system.
2. Copy any user's files you want to save to an archive directory. For example, if you want to save a copy of user *lazarus*'s entire directory hierarchy on a flexible disk, insert a formatted flexible disk into the system's disk drive, then type the following command:

```
# fbr -cv /usr/lazarus
```

3. Remove the user's file tree. For example, if *lazarus*'s login directory is */usr/lazarus*, type:

```
# rm -fr /usr/lazarus
```

4. Remove the user from the */etc/passwd* file with the **mkuser -r** command. For example:

```
# mkuser -r lazarus
```

How to Obtain Information About Users

Certain information about each user is stored in the `/etc/passwd` file. This information includes the user's:

- User name
- Encrypted password
- Numeric user ID
- Numeric group ID
- Real name, office, extension, home phone, and any other information you may wish to store in this field
- Login directory
- Login shell

The following command lists the line in the `/etc/passwd` file that pertains to the user named "lazarus":

```
# grep '^lazarus' /etc/passwd
lazarus:PZoYIRnPVs7EY:276:175:Lazarus Long;x357:/usr/lazarus:
```

The `/etc/group` file lists the groups to which a user belongs. For example, the following command tells you the groups to which `frodo` belongs:

```
# fgrep frodo /etc/group
ai::85:severian,lazarus,frodo
lws::104:frodo,hector,bilbo
mc68000::175:jolenta,darcus,typhon,frodo
```

How to Assign and Modify Passwords

Passwords can be assigned to user accounts. If a password is not assigned to a user account, the user will not be asked for a password when that user logs into the system.

You can assign a password to a user or modify that user's password, with the `passwd` command. You must be logged into the root account to assign or modify a password. A password should consist of six or more of the printable ASCII characters—characters in the range of 41 to 176 (octal).

When you install a user, you may want to assign an easy-to-remember password to that user. For example, to assign the password `frodo` to user `frodo`, type:

```
# passwd frodo
New password: frodo      [ typed but not echoed ]
Retype password: frodo   [ typed but not echoed ]
```

When frodo logs in, he can use the **passwd** command to change his password to any sequence of characters he wants.

How to Delete a Password

You can delete the password for any user by deleting the user's password from the */etc/passwd* file—you cannot delete a password with the **passwd** command. (The password is encrypted in the */etc/passwd* file.) To delete the user's password, delete all information between the first two colons (:) in the user's entry in */etc/passwd*. For example, the line for frodo might look like this:

```
frodo:evX7ab2./762w:15:11::/usr/frodo:
```

 └───┬───┘
 this is the password field

To delete frodo's password with the TNIX **ed** editor, type:

```
# ed /etc/passwd
474
/frodo/
frodo:evX7ab2./762w:15:11::/usr/frodo:
c
frodo::15:11::/usr/frodo:
.
p
frodo::15:11::/usr/frodo:
w
461
q
```

Now, whenever frodo logs in, he will not be asked for a password.

How to Change the Login Message

You can create a login message for all users. The login message is the first message that each user sees after logging into TNIX. This message is contained in the */etc/motd* ("message of the day") file. If this file doesn't exist, create it. For example, if the */etc/motd* file contains the text

```
Next system downtime: Friday at 6pm for backups.
```

that message is displayed on a user's terminal whenever that user logs in. To change the login message, simply change the contents of the */etc/motd* file.

How to Send a Message to All Users

You can send a message to all users who are currently logged into the system with the **wall** command. You must be logged into the root account to use the **wall** command. For example, to notify all users that you will be bringing the system down in five minutes, type:

```
# /etc/wall
system coming down in five minutes
<CTRL-D>
```

Or, you can create a shell program called **countdown** that sends a message to all users once a minute for three minutes saying that you are bringing the system down. Figure 1-4 shows the text of the **countdown** command.

Place the text in Fig. 1-4 in a file called **countdown**. Make the file executable by the root user by typing:

```
# chmod u+rwx,go=r countdown
```

Now, whenever you bring the system down, you can warn all users by typing:

```
# countdown
```

How to Mount a Filesystem

A filesystem is a collection of data that is stored on one or more physical devices, such as an additional hard disk. Before TNIX can access any data on an additional disk, the TNIX filesystem on the additional disk must be *mounted*. For example, if the filesystem that you want to mount is called */usr1*, and the additional logical disk device that it is on is called */dev/hd1*, type:

```
# /etc/mount /dev/hd1 /usr1
```

The */etc/checklist* file should contain a list of logical devices that can be mounted on your system. For ease of use, you can place any necessary **mount** commands in the */etc/rc* file. That way, the proper filesystems will be mounted each time you boot the system.

NOTE

The root filesystem is automatically mounted each time you boot the system. You do not mount or unmount the root filesystem.

```
for i in 3 2 1
do
    echo "System coming down in $i minutes. Please log out." | /etc/wall
    sleep 60
done
```

Fig. 1-4. The countdown shell command file.

How to Unmount a Filesystem

Before you shut down your system, use the **umount** command to unmount any mounted filesystems. First, use the **mount** command to determine which filesystems are mounted. For example:

```
# /etc/mount
hdl on usr1
```

Now enter the appropriate **umount** command. For example, if the */usr1* filesystem is located on logical device */dev/hd1*, type:

```
# /etc/umount /dev/hd1
```

CREATING AND RESTORING SYSTEM BACKUPS

The following procedures describe how to perform system backups, how to restore data to your system from backups, and how to reinitialize your system and restore data in the event of a system crash.

How to Perform a Full Backup

This procedure tells how to create a full backup of your system, referred to as a “level-0 dump”. This example assumes that you are creating a full backup of the root filesystem on logical device */dev/rhd0* and that you are using double-sided, double-density flexible disks for the backup medium. (The **dump** command allows you to use single-density flexible disks, magnetic tapes and magnetic cartridges by specifying the device that **dump** writes to and/or the maximum number of blocks on each dump volume.)

NOTE

*To perform a full backup of an additional hard disk, replace */dev/rhd0*, the logical device name for the 8560's internal disk, with the appropriate logical device name for the additional disk. The */etc/checklist* file should contain a list of logical devices attached to your system.*

1. Log into the root account on the system terminal:

```
login: root .
```

```
Password:          [ Enter your root account password, if necessary. ]
```

2. Enter the **who** command to make sure that you are the only person logged into your system. If it is possible that another user may attempt to log into the system while you are performing a backup of the root filesystem, you should put the system into single-user mode before proceeding.

3. If you are performing a backup of a non-root filesystem, unmount that filesystem, using the procedure "How to Unmount a Filesystem," earlier in this section.
4. Execute the **dump** command using one of the following command line arguments:

- If you are using double-sided, double-density flexible disks, type:
`dump Ou /dev/rhd0`
- If you are using single-sided, double-density flexible disks, type:
`dump Ou /dev/rhd0 -s 995`
- If you are using magnetic tapes in conjunction with a GPIB interface, enter the **dump** command using the following format:
`dump Ou /dev/rhd0 -f /dev/name -s blocks`

In this command, *name* is the name of the magnetic tape drive, and *blocks* is the capacity in 512-byte blocks of the magnetic tape. Refer to your *8560 Magnetic Tape Interface Users Manual* for further information.

NOTE

*The rest of this example shows how to use **dump** with flexible disks:*

Determine how many formatted, double-density, double-sided flexible disks you will need to perform a full backup of your system. Open the flexible disk drive door, then enter the following **dump** command:

```
# dump 0 /dev/rhd0
[ Several messages are displayed before dump prints the following message. ]
dump: estimated 16259 blocks on 9 volume(s)
[ According to this example, you should have 9 formatted disks available before
  starting the backup procedure. ]
.
.
.
[ Several error messages are displayed because the flexible disk drive door is
  open. ]
```

5. Format as many flexible disks as necessary. To format a flexible disk, cover the disk's write-protect slot, insert the disk into the disk drive, then type the **format** command.
6. Insert a formatted disk into the disk drive, then type the following command to start the backup procedure:

```
# dump Ou /dev/rhd0 -v
```

The **dump** command will guide you through the backup process, asking you to insert new disks into the disk drive when necessary. If an additional disk is necessary, **dump** prints the following message:

```
dump: change volumes, current inode = XXX
[ XXX is the starting inode number of the next volume. ]
```

Before inserting the new disk into the disk drive, label it with the following information:

- Date
- Dump level (0)
- Volume number (the first disk is volume 1, the second is volume 2, and so on)
- Starting inode number (the starting inode number for volume 1 is "2")

Once you have labeled the disk with this information, insert it into the disk drive, close the disk drive door, then press the RETURN key.

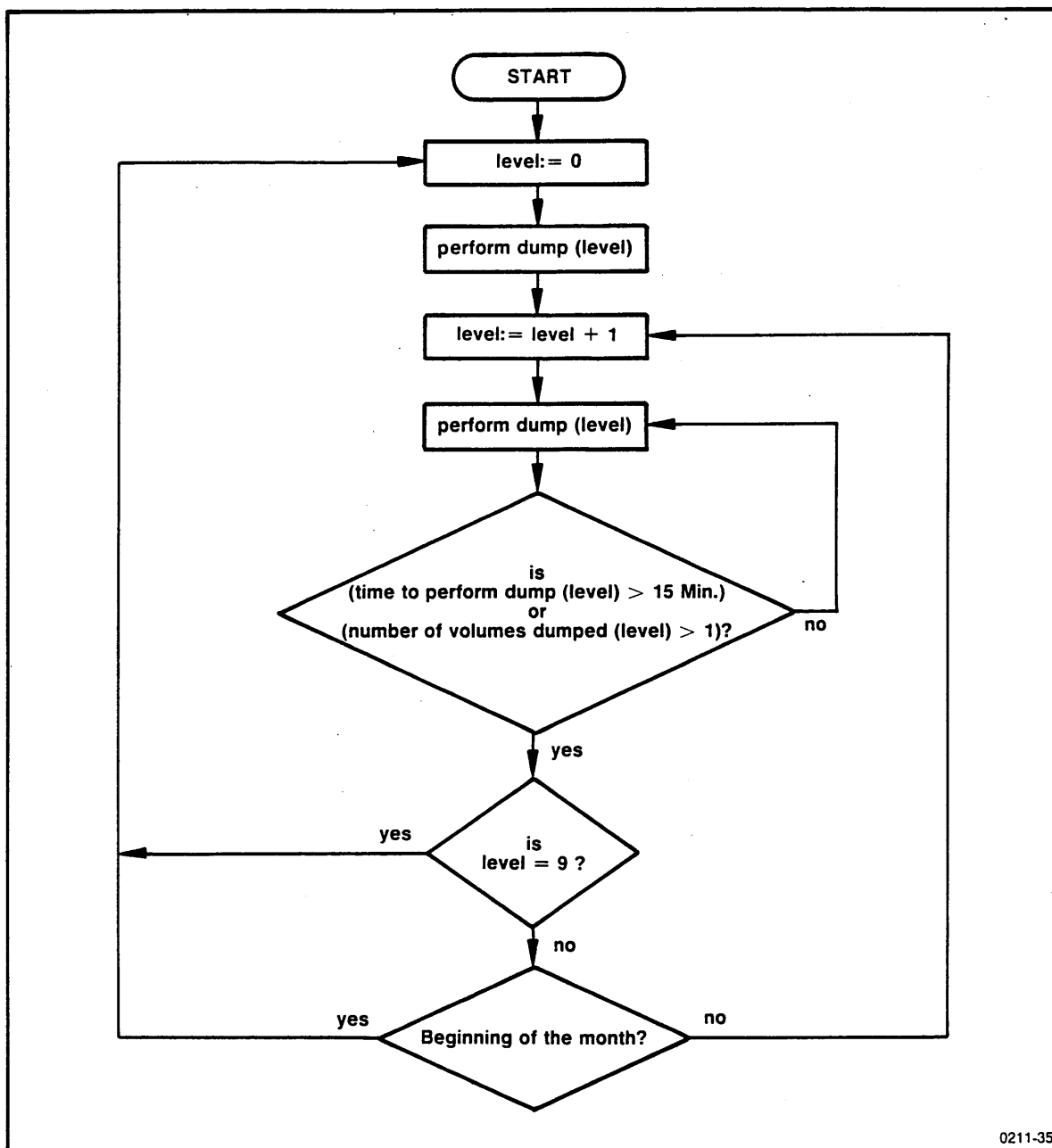
How to Perform an Incremental Backup

To perform periodic backups of your filesystem, first perform a full (level-0) backup. The full backup is followed by fast, incremental dumps (levels 1 through 9) that store only those files that have changed since the last incremental or complete backup performed at a lower level.

For example, assume that your company has a corporate archive policy that requires you to perform a complete backup of data at the beginning of each month for permanent, offline storage. Assume that you want a fast method of backing up your system once each day, so that you never have to worry about losing more than one day's worth of data. Figure 1-5 presents an algorithm for performing an incremental backup; the accompanying text explains this procedure in more detail.

Let's look at each step:

1. At the beginning of each month, perform a level-0 dump of your entire system. The level-0 dump copies all data on a single filesystem onto the backup media (flexible disks or magnetic tapes).
2. On the next day, perform an incremental backup using dump level 1. This dump copies all files that have changed since the last level-0 dump onto the backup medium.
3. On the next day, perform an incremental backup at the same dump level as the last incremental backup that you performed. This dump copies all files that have changed since the last incremental backup performed at a lesser dump level. Repeat this step each day until the incremental backup takes longer than 15 minutes or more than one dump volume to complete. Then advance to step 4.



0211-35

Fig. 1-5. An algorithm for performing incremental backups.

4. If you have not been performing a level-9 dump, perform the next level dump, then return to step 3. If you have been performing a level-9 dump, perform a level-0 dump, then return to step 2.

Continue the above process until the beginning of the next month, when you start from step 1 again.

How to Recover Selected Files from Backups

This procedure tells how to recover selected files from backups. To recover all files from backups, refer to the procedures “How to Reinitialize TNIX and Restore the Root Filesystem” and “How to Restore Backups to a Non-Root Filesystem”, later in this section.

CAUTION

TNIX file security does not apply to backups. Any user can extract any file from backups. Because of this, only the system manager should be allowed to recover files from backups. This is especially important for installations that store sensitive information on their systems.

Let's look at an example that shows how to restore files from either a full or an incremental backup.

First, use the **dumpdir** command to list the contents of a backup set to make sure that the file you want to restore is on that backup set. Next, use the **restor** command to recover files from that backup set.

Assume that you need to restore all files belonging to user **bjorng**. The files may be on any or all of three dump volumes (in this case, flexible disks). The dump volumes are labeled by inode numbers: volume I contains 2 to 1006, volume II contains 1007 to 4628, and volume III contains 4629 to 7268.

1. Find all files belonging to **bjorng** on the dump set, and sort the filenames in order of increasing inode numbers. To make things easy, you can put the sorted list into the file *list*. One command line performs the task. Be sure to put the first dump volume into the drive.

```
# dumpdir -f /dev/rfd0 | grep /usr/bjorng | sort +2 > list
```

The file *list* now contains the following text:

```
dumpdir:      /usr/bjorng/file.cabinet      237
dumpdir:      /usr/bjorng/file.single      516
dumpdir:      /usr/bjorng/file.rasp      2813
dumpdir:      /usr/bjorng/file.nail      2815
dumpdir:      /usr/bjorng/file.round      6972
```

According to *list*, the dump set contains five files that belong to **bjorng**. For each entry in *list*, the file's inode number follows the file's name.

2. Divide the filenames in *list* among three new files, *vol.1*, *vol.2*, and *vol.3*. These new files correspond to the three dump volumes, and contain the names of **bjorng**'s files that reside on each volume. That is, you want *vol.1* to contain:

```
/usr/bjorng/file.cabinet
/usr/bjorng/file.single
```

and *vol.2* to contain:

```
/usr/bjorng/file.rasp
/usr/bjorng/file.nail
```

and *vol.3* to contain:

```
/usr/bjorng/file.round
```

Use the following command lines to edit *list* and create *vol.1*, *vol.2*, and *vol.3*:

```
# ed list

g/^\.*\usr/s//\usr/ [ These two lines transform the
g/[0-9]* *$/s//g     list file to a list of filenames. ]

1,2w!vol.1           [ These three lines write the contents
3,4w!vol.2           of this list file out to three separate
5w!vol.3             files: vol.1, vol.2, and vol.3. ]

q
?
q
#
```

Now, you can use *vol.1*, *vol.2*, and *vol.3* with **restor** to write bjornng's files into the current directory.

3. Install the first dump volume into the flexible disk drive, and type:

```
# restor -xf /dev/rfd0 'cat vol.1'
```

Install the second dump volume, and type:

```
# restor -xf /dev/rfd0 'cat vol.2'
```

Install the third dump volume, and type:

```
# restor -xf /dev/rfd0 'cat vol.3'
```

The current directory now contains bjornng's five files, named according to their respective inode numbers.

4. Change the user and group ownership of these files to the proper values with the **chown** and **chgrp** commands. For example, if the current directory contains only those files that you have extracted from the backup set, and if bjornng's group is "ai", type:

```
# /etc/chown bjornng *
# /etc/chgrp ai *
```

5. Move these files to whatever other directory you wish. One easy way to do this is to create a file that contains each file's pathname followed by its inode number, one file per line. For example, you could copy the above *list* file to a file called *movelist*, then enter the following **ed** commands to transform it into the appropriate format:

```
# ed movelist
l,$p
dumpdir:      /usr/bjorng/file.cabinet      237
dumpdir:      /usr/bjorng/file.single    516
dumpdir:      /usr/bjorng/file.rasp      2813
dumpdir:      /usr/bjorng/file.nail      2815
dumpdir:      /usr/bjorng/file.round     6972
g/^.*/s///gp
```

[The above command line transforms the above five lines to the following format:]

```
/usr/bjorng/file.cabinet      237
/usr/bjorng/file.single       516
/usr/bjorng/file.rasp         2813
/usr/bjorng/file.nail         2815
/usr/bjorng/file.round        6972
```

```
w
q
```

Now you can move these inode-named files to their correct directories with the following command:

```
# cat movelist |
> while read x y
> do mv $y $x
> done
```

How to Reinitialize TNIX and Restore the Root Filesystem

Perform this procedure only when you cannot recover from a serious system crash. Normally, the standalone **syschk** program can repair most filesystem-related problems that can cause a system crash. The following discussion tells how to:

- Reinitialize TNIX for a system with different sizes of hard disks, or a root filesystem spanning more than one disk
- Reload software from backups or from the Tektronix-supplied distribution disks

NOTE

*The **mkfs** and **cvt** commands used in the following procedure require you to type certain parameters related to the size of your system's root filesystem. Refer to Section 3 for the **mkfs** and **cvt** commands associated with the different root filesystem sizes.*

Before performing the following procedure, you should have a root filesystem located on logical device */dev/rhd0* (the 8560's internal disk). Replace the **mkfs** and **cvt** parameters shown in the example with the parameters appropriate for your filesystem.

Reinitialize TNIX and restore the root filesystem as follows:

1. Insert the Standalone Utilities Disk into the flexible disk drive and close the disk drive door.
2. Move the AC POWER switch to the ON position and the DC switch to the ON position if your system is powered down.
3. Move the RUN/HALT switch to the RUN position.
4. Toggle the RESTART switch. Within one minute, the following message appears on the system terminal:

```
fbr filename to boot>
```

5. Execute the standalone **mkboot** command:

```
fbr filename to boot>mkboot
boot successfully copied
Exit called
```

6. Execute the standalone **mkfs** command:

```
fbr filename to boot>mkfs
hd0 = 69576 blocks
mkfs arguments: 65000
/dev/hd0 = 65000 blocks
mkfs: isize = 20800
Exit called
```

7. Execute the standalone **restor** command.

```
fbr filename to boot>restor
restor arguments:
restor: Mount volume 1
.
.
.
```

When **restor** prompts you for arguments, perform one of the following steps:

- a. Enter a response in the form **-f mt(type,address)** if you are using magnetic tapes in conjunction with a GPIB interface. *Type* must be either a "0" (indicating a Dylon 2001/9001 7/9 track Magnetic Tape System) or a "1" (indicating a Dylon 4000A Digital Cartridge Recording System); *address* is the tape drive's primary address. For example, if you have Dylon 9-track tape drive at GPIB primary address 3, respond to the prompt with **-f mt(0,3)**.
- b. If you are using flexible disks, press the RETURN key.

NOTE

The rest of this example shows how to use restor with flexible disks:

When **restor** asks you to "Mount volume 1" (the "Mount" message has nothing to do with the **mount** command), remove the Standalone Utilities Disk from the disk drive, insert volume 1 of your most recent level-0 dump into the disk drive, then press the RETURN key. If you do not have a level-0 dump of your system, use the Tektronix-supplied distribution disks instead.

When **restor** finishes copying all files from volume 1 of the dump set to your root filesystem, it asks you to mount the next volume of the dump set (if there is another volume in the dump set). Insert the specified volume into the disk drive, then press the RETURN key. When **restor** finishes copying all files in the dump set to your root filesystem, the following message is displayed on your terminal:

```
restor: end of dump
Exit called
```

8. Perform this step **ONLY** if you are restoring your system from a level-0 dump of your system instead of the Tektronix-supplied distribution disks.

If you (or someone else at your site) have been making incremental backups, perform the following steps:

- a. Restore the lowest-level incremental backup that is more recent than the level-0 backup. For example, if level 1, 2, and 3 backups have been performed since the latest level-0 backup, restore the most recent level-1 backup. (Refer back to step 7 for details.)
- b. Restore the next-higher-level incremental backup that is more recent than the previous incremental backup restored. Repeat this step until all incremental backups that meet this condition have been restored.

Figure 1-6 is an algorithm that shows how to perform a restore operation involving one level-0 backup and one or more incremental backup sets (levels 1 through 9).

9. Put the Standalone Utilities Disk into the disk drive, close the disk drive door, and toggle the RESTART switch.
10. Perform this step **ONLY** if you are restoring your system from the Tektronix-supplied distribution disks instead of a level-0 dump of your system.

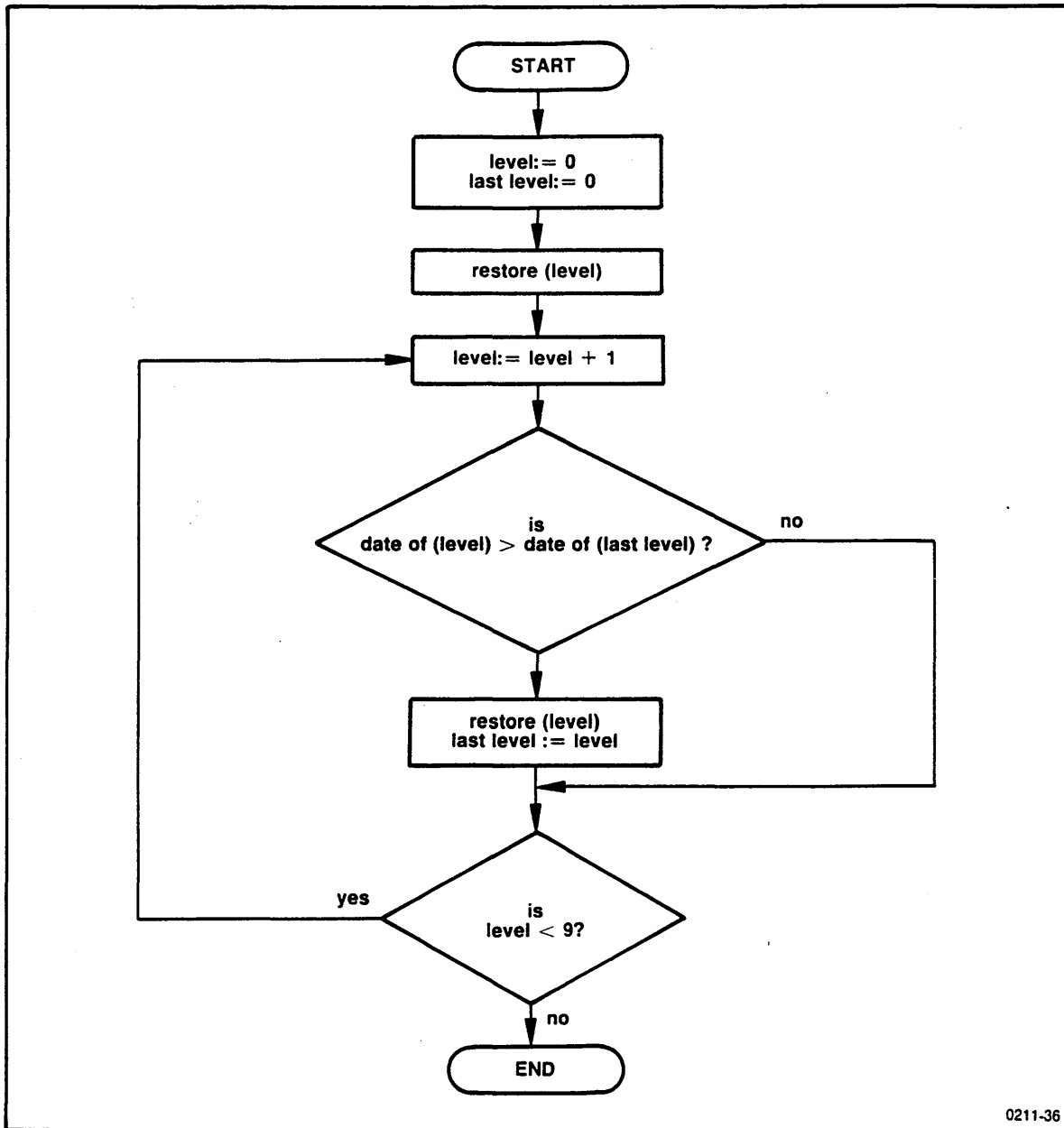
Execute the **cvt** command:

```
fbr filename to boot>cvt
cvt arguments: -w
swplo NNN
swplo NNN
nswap XXX
nswap XXX
pipdev YYY      |Refer to mkfs and cvt commands
pipdev YYY      |in Section 3 for explanation of
rootdev YYY    |of NNN, XXX and YYY values.|
rootdev YYY
swapdev YYY
swapdev YYY
<CTRL-D>
system has XXX bytes left
Exit called
```

11. Execute the **syschk** command:

```
fbr filename to boot>syschk
syschk arguments: -bw
```

12. Remove the Standalone Utilities Disk from the disk drive, and toggle the RESTART switch.



0211-36

Fig. 1-6. An algorithm for restoring incremental backups.

13. Perform this step ONLY if you are restoring your system from the Tektronix-supplied distribution disks instead of a level-0 dump of your system.
 - Put the system into single-user mode by typing “y” when the following message is displayed:


```

          Do you want to remain single user?
          Enter y for yes, n for no, or question mark for more
          information: y
          
```

- Examine the `/etc/ttys` file to see if the number of lines in the `/etc/ttys` file corresponds to the number of HSI ports on your system. For example, if your system has four HSI ports, the `/etc/ttys` file should contain four lines similar to the following lines (the first two characters of each line may differ):

```
12tty0
12tty1
12tty2
12tty3
```

- If the number of lines in the `/etc/ttys` file does not match the number of ports on your system, perform one of the following steps:
 - If there are two HSI ports on your system, type:


```
# cp /etc/ttys2 /etc/ttys
```
 - If there are four HSI ports on your system, type:


```
# cp /etc/ttys4 /etc/ttys
```
 - If there are eight HSI ports on your system, type:


```
# cp /etc/ttys8 /etc/ttys
```
- When you have ensured that the number of HSI ports on your system corresponds to the contents of the `/etc/ttys` file, type `<CTRL-D>` to resume normal operations.

14. Put the system into multi-user mode by typing “n” when the following message is displayed:

```
Do you want to remain single user?
Enter y for yes, n for no, or question mark for more
information: n
```

You may now resume normal operations.

How to Restore Backups to a Non-Root Filesystem

The following procedure tells how to restore backups to a non-root filesystem. In this procedure, the `mkfs` command requires you to type certain parameters related to the size of your system’s non-root filesystem. Refer to Section 3, “Filesystem Configuration Record,” for the `mkfs` command associated with the different non-root filesystem sizes.

The example used here assumes that you have a non-root filesystem located on logical device `/dev/rhd1` (an additional hard disk.) Replace the `mkfs` parameters shown in the example with the appropriate parameters determined in Section 3, “Filesystem Configurations Record.”

1. Make sure that the system is in multi-user mode.
2. Log into the `root` account:


```
login: root
Password:      [ Enter your root account password, if necessary. ]
```
3. Unmount the logical device containing the filesystem being restored. For example:


```
# /etc/umount /dev/rhd1
```


4. Execute the **mkfs** command. For example:

```
# mkfs /dev/rhd1 NNN
```

/dev/rhd1 is the “Logical Device Name” and *NNN* the “Non-Root Filesystem Size (Blocks)” parameter.

5. Perform the rest of this procedure *only* if you have a backup of your non-root filesystem. Execute the **restor** command:

- a. If you are using magnetic tapes, enter a command line in the form **restor -r -f mt(type,address) /dev/rhd1**. *Type* must be either a “0” (indicating a Dylon 2001/9001 7/9 track Magnetic Tape System) or a “1” (indicating a Dylon 4000A Digital Cartridge Recording System); *address* is the tape drive’s primary address. For example, if you have a Dylon 9-track tape drive at GPIB primary address 3, type:

```
# restor -r -f mt(0,3) /dev/rhd1
```

[*/dev/rhd1* is the name of the logical device to which you are restoring data.]

- b. If you are using flexible disks, type the following command:

```
# restor -r /dev/rhd1
```

[*/dev/rhd1* is the name of the logical device to which you are restoring data.]

NOTE

*The rest of this example shows how to use **restor** with flexible disks.*

When **restor** asks you to “Mount volume 1”, insert volume 1 of your most recent level-0 dump into the disk drive and press the RETURN key.

When **restor** finishes copying all files from volume 1 of the dump set to your non-root filesystem, it asks you to mount the next volume of the dump set (if there is another volume in the dump set). Insert the specified volume into the disk drive and press the RETURN key. When **restor** finishes copying all files in the dump set to your non-root filesystem, the following message is displayed on your terminal:

```
restor: end of dump
```

6. Figure 1-6, earlier in this section, showed how to perform a restore operation involving one level-0 backup and one or more incremental backup sets (levels 1 through 9). If you (or someone else on your staff) have been making incremental backups, perform the following steps:
 - a. Restore the lowest-level incremental backup that is more recent than the level-0 backup. For example, if level 1, 2, and 3 backups have been performed since the latest level-0 backup, restore the most recent level-1 backup. (Refer back to step 5 for details.)
 - b. Restore the next-higher-level incremental backup that is more recent than the previous incremental backup restored. Repeat this step until all incremental backups that meet this condition have been restored.

7. Execute the **syschk** command:

```
# syschk -bw /dev/rhd1
```

8. Finally, mount the filesystem with the **mount** command, for example,

```
# /etc/mount /dev/hdl /usr1
```

RECOVERING FROM A SYSTEM CRASH

The following paragraphs suggest some procedures to follow in case your system crashes.

Run Standalone Syschk

Put the system into standalone mode and run the **syschk** program.

1. Put the system into standalone mode, as described in the procedure “How to Change the System’s Operating Mode,” earlier in this section.
2. Type **syschk** when the system displays the following line on the system terminal:

```
fbr filename to boot>syschk
```
3. When **syschk** asks which options to use, type:

```
syschk arguments: -bw
```

If **syschk** discovers any problems, it will first ask you if you want it to attempt to repair the problem. Type “y”. Repeat this process until **syschk** tells you that there are no remaining errors. **Syschk** will fix most errors.

Check the /etc Directory Files

An incorrect modification to one of the files in the */etc* directory, such as the */etc/ttys* or the */etc/checklist* file, can cause the system to crash. For example, if you incorrectly modify the */etc/ttys* file so that the number of entries exceeds the number of ports on your system (for example, eight entries in the */etc/ttys* file but only four ports on the system), your system will crash. If you suspect an error in one of the */etc* files, boot the system into single-user mode. Then you can make any corrections necessary to the system file.

Install a New Boot Block

If the flexible disk drive door is open and the system does not respond with the “Welcome to TNIX” message when you toggle the RESTART switch or power up the system, you should install a new boot block onto the root filesystem. The boot block is a block of data on the 8560’s internal disk that is read into main memory by the boot ROM whenever you power up the system or toggle the RESTART switch. The boot block is located at physical disk address cylinder 0, sector 0, block 0. To install a new boot block, insert the Standalone Utilities Disk into the flexible disk drive, boot the system into standalone mode, then type:

```
fbr filename to boot>mkboot
```

If the system still does not boot properly, contact your Tektronix service representative for additional advice or suggested procedures.

Problems That Can Cause a System to Crash

The following discussion explains several problems that can cause the system to crash. This discussion also tells how to dump the contents of system memory to a flexible disk; you can include this disk with your problem report.

When TNIX detects an unrecoverable error, it displays a message on the system terminal describing the error and crashes. The following paragraphs describe these messages and suggest ways to correct some of the errors.

tnix: panic: blkdev. The *getblk* routine (an internal TNIX routine) was called with a nonexistent major device number as an argument. Try rebooting the system or restoring a known-good version of TNIX from backups. If the problem recurs, contact your Tektronix field service representative.

tnix: panic: devtab. The major device number passed to *getblk* has a null entry in the device table. Try rebooting the system or restoring a known-good version of TNIX from backups. If the problem recurs, contact your Tektronix field service representative.

tnix: panic: iinit. An I/O error occurred while reading the root filesystem's superblock during initialization. Try rebooting the system. If the problem recurs, a problem may exist within the fixed disk or the disk controller. Contact your Tektronix field service representative.

tnix: panic: IO err in swap. An I/O error occurred while swapping memory contents. Try rebooting the system. If the problem recurs, a problem may exist within the fixed disk or the disk controller. Contact your Tektronix field service representative.

tnix: panic: no fs. The *getfs* routine (an internal TNIX routine) could not locate a device in the mount table. Try rebooting the system, checking the *mount* parameter with the *cvt* command, or restoring a known-good version of TNIX from backups. If the problem recurs, contact your Tektronix field service representative.

tnix: panic: no imt. The *iget* routine (an internal TNIX routine) could not locate a device in the mounted-device table. Try rebooting the system, checking the *mount* parameter with the *cvt* command, or restoring a known-good version of TNIX from backups. If the problem recurs, contact your Tektronix field service representative.

tnix: panic: no procs. In the *newproc* routine (an internal TNIX routine), a process slot disappeared after the routine checked that it existed. Try rebooting the system. If the problem recurs, a problem may exist within the fixed disk or the disk controller. Contact your Tektronix field service representative.

tnix: panic: Out of swap. There are no available entries in the swap map. Try increasing the number of swap map entries with the *cvt* command. If the problem recurs, contact your Tektronix field service representative.

tnix: panic: out of swap space. A program needs to be swapped out and no more swap space is available. Try increasing the amount of swap space. To do this, increase the *nswap* parameter for the **cvt** command. You may have to decrease **cvt**'s *swplo* parameter as well. If you decrease *swplo*, be sure to run **mkfs** to decrease the number of disk blocks allocated to the root filesystem by a corresponding amount and restore the filesystem from backups. If the problem recurs, contact your Tektronix field service representative.

tnix: panic: parity. A memory parity error has occurred while in system space. Try rebooting the system. If the problem recurs, a system memory board is probably defective. Contact your Tektronix field service representative.

tnix: panic: Running a dead proc. A terminated process was about to be set running. Try rebooting the system or restoring a known-good version of TNIX from backups. If the problem recurs, contact your Tektronix field service representative.

tnix: panic: Sleeping on wchan 0. An invalid (0) parameter was passed to **sleep** (an internal TNIX routine). Try rebooting the system or restoring a known-good version of TNIX from backups. If the problem recurs, contact your Tektronix field service representative.

tnix: panic: trap. An unexpected trap occurred within the system. This message is preceded by four associated messages. When these messages appear, you may wish to write them down for later reference.

tnix: ka6 = nnnn The octal number *nnnn* is the contents of the kernel active page register that indicates the area in which the system's stack is kept.

tnix: aps = nnnn The octal number *nnnn* is the location where the processor stored the program status word during the trap.

tnix: pc = nnnn ps = xxxx The octal numbers *nnnn* and *xxxx* are the program counter contents and the processor status word contents, respectively, at the time of the trap.

tnix: trap type n The octal number *n* identifies the trap that occurred. The trap types are:

tnix: trap type 0 Bus error. Three conditions can cause this error:

- A custom program owned by root accessed an address that had no associated hardware. The program needs debugging; do not run the program from the root account until it has been debugged.
- Standard TNIX software accessed an address that had no associated hardware. Try rebooting the system or restoring a known-good version of all TNIX software from backups. If the problem recurs, contact your Tektronix field service representative.
- A hardware failure occurred on a memory board or an I/O Board Device Register. Contact your Tektronix field service representative.

| | |
|--------------------|---|
| tnix: trap type 1 | <p>Illegal instruction. An illegal instruction may be an unimplemented opcode or a nonsense instruction, such as “jump to register R0”. Two conditions can cause this error:</p> <ul style="list-style-type: none">• A custom program contains a bad opcode. The program needs debugging.• Part of the standard TNIX software contains a bad opcode. Try rebooting the system or restoring a known-good version of all TNIX software from backups. If the problem recurs, contact your Tektronix field service representative. |
| tnix: trap type 2 | <p>BPT/trace. The program either executed the breakpoint instruction or set the trace bit in the processor status word. Two conditions can cause this error:</p> <ul style="list-style-type: none">• A custom program owned by root contains instructions to cause breakpoints or set the trace bit. Debug the program with the debugging tools provided with the optional TNIX Native Programming Package and don't run the program from the root account until it has been debugged.• Part of the standard TNIX software is corrupt. Try rebooting the system or restoring a known-good version of all TNIX software from backups. If the problem recurs, contact your Tektronix field service representative. |
| tnix: trap type 3 | <p>IOT (I/O trap instruction). This opcode should not be used in custom programs. If this error occurs while running standard TNIX software, the software may be corrupt. Try rebooting the system or restoring a known-good version of all TNIX software from backups. If the problem recurs, contact your Tektronix field service representative.</p> |
| tnix: trap type 4 | <p>Power failure. The AC power source for the system exceeded the allowable limits for voltage or frequency. This problem is usually caused by brief glitches on the power line. If the problem occurs frequently, you may want to install a commercial power-line conditioner or an uninterruptable power supply.</p> |
| tnix: trap type 5 | <p>EMT (emulator trap) instruction. This opcode should not be used in custom programs. If this error occurs while running standard TNIX software, the software may be corrupt. Try rebooting the system or restoring a known-good version of all TNIX software from backups. If the problem recurs, contact your Tektronix field service representative.</p> |
| tnix: trap type 6 | <p>Recursive system call.</p> |
| tnix: trap type 10 | <p>Floating point trap. A program contained an illegal floating point opcode, or a particular floating point operation failed (such as dividing by zero). Two conditions can cause this error:</p> |

- A custom program contains bad opcodes or arithmetic routines that don't adequately check for error conditions. The program needs debugging.
- Part of the standard TNIX software is corrupt. Try rebooting the system, or restoring a known-good version of all TNIX software from backups. If the problem recurs, contact your Tektronix field service representative.

tnix: trap type 11 Segmentation violation.

tnix: trap type 12 Memory parity error. This error is usually caused by random discharge of individual dynamic memory cells, and should occur very infrequently, if at all. Reboot the system. If memory parity errors occur with any degree of frequency, contact your Tektronix field service representative.

If the system processor was in user mode when the trap occurred, an octal 20 may be added to the trap number. For example, a "trap type 31" indicates a segmentation violation that occurred while the processor was in user mode.

Obtaining a System (Core) Dump

If you can't correct a problem that causes your system to crash, perform the following procedure to obtain a system dump at the time of the crash:

1. Place a formatted disk into the flexible disk drive.
2. Set the RUN/HALT switch to the HALT position and plug a terminal into the Line Printer 2 Port. (Do NOT power down the system or toggle the RESTART switch.) This step causes the system processor to execute its console ODT microcode.
3. Move the RUN/HALT switch to the RUN position. The system processor will continue to execute ODT.
4. Type "R7/". The terminal will display an octal number and a space character. Type "44" and RETURN.
5. Type "P". The system will write to the flexible disk for about 40 seconds and display a number on the screen.
 - If the number is 004466, the dump is complete. You may restart the system as usual, being sure to check the filesystem for possible errors.
 - If the number is 004462, insert another formatted flexible disk into the drive and type "P". The system will write to the flexible disk for about 3 or 4 seconds. The number 004466 will appear on the terminal. The dump is now complete and you may restart the system as usual. Be sure to check the filesystem for possible errors.

Section 2

ADDING TERMINALS, 8540s, 8550s, AND PRINTERS

| | Page |
|--|------|
| Introduction | 2-1 |
| Configuring a Port | 2-1 |
| The /etc/ttys File | 2-2 |
| Selecting the Baud Rate | 2-3 |
| Variable Baud Rate (0-7) | 2-3 |
| Initializing Ports | 2-3 |
| Connecting a Terminal | 2-4 |
| Cable Connections | 2-4 |
| /etc/ttys File Entry | 2-4 |
| Connecting an 8540 Integration Unit | 2-4 |
| 8560—RS-422—8540—Terminal | 2-5 |
| Cable Connections | 2-5 |
| /etc/ttys File Entry | 2-6 |
| Establishing Communication | 2-6 |
| Terminal—8560—RS-422—8540 | 2-6 |
| Cable Connections | 2-7 |
| /etc/ttys File Entry | 2-7 |
| Establishing Communication | 2-7 |
| 8560—Modem—8540—Terminal | 2-7 |
| Cable Connections | 2-8 |
| /etc/ttys File Entry | 2-8 |
| Establishing Communication | 2-8 |
| Connecting an 8550 MDL | 2-8 |
| 8560—RS-232-C—8550—Terminal | 2-8 |
| Cable Connections | 2-9 |
| /etc/ttys File Entry | 2-9 |
| Establishing Communication | 2-10 |
| 8560—Modem—8550—Terminal | 2-10 |
| Cable Connections | 2-10 |
| /etc/ttys File Entry | 2-11 |
| Establishing Communication | 2-11 |
| Connecting and Configuring a Line Printer | 2-11 |
| Configure the Line Printer | 2-11 |
| Connecting a Line Printer to Your 8560 | 2-12 |
| Configure TNIX to Correctly Operate the Line Printer | 2-12 |

ILLUSTRATIONS

| Fig. No. | | Page |
|-------------|---|------|
| 2-1 | 8560—RS-422—8540—terminal configuration | 2-5 |
| 2-2 | Terminal—8560—RS-422—8540 configuration | 2-6 |
| 2-3 | 8560—modem—8540—terminal configuration | 2-7 |
| 2-4 | 8560—RS-232-C—8550—terminal configuration | 2-9 |
| 2-5 | 8560—modem—8550—terminal configuration | 2-10 |

TABLES

| Table No. | | Page |
|--------------|---|------|
| 2-1 | Baud Rate Selection in the /etc/ttys file | 2-3 |

Section 2

ADDING TERMINALS, 8540s, 8550s, AND PRINTERS

INTRODUCTION

This section shows you how to connect terminals, 8540 and 8550 workstations, and line printers. This section covers the following topics:

- Configuring a port interface
- Connecting a terminal
- Connecting an 8540 Integration Unit
- Connecting an 8550 MDL
- Connecting and configuring a line printer

NOTE

Before you read this section, your system should be unpacked, installed, and verified by qualified service personnel as described in the hardware installation portion, Sections 4 through 7, of this manual.

CONFIGURING A PORT

8560 HSI Port 0 is factory-jumpered for RS-232-C protocol for use with a system terminal. HSI Ports 1 through 7 are normally configured for RS-422 protocol. Therefore, if you want to connect a terminal, an 8550, or a modem to any of HSI Ports 1 through 7, you must reconfigure the port to make it compatible with RS-232-C protocol.

NOTE

More detailed interface and port connector information is provided in the appendixes in this manual. Appendix B contains system specifications and the port connector pin assignments. Appendix C contains interface signal connections.

Two separate operations are necessary to reconfigure an HSI port for either RS-232-C or RS-422 protocol:

1. Modify the *etc/ttys* file using any 8560 text editor.
2. Move the corresponding jumpers on the I/O Adapter Board into the appropriate position.



I/O Adapter Board jumpers are described in Section 6 of this manual and should be moved only by qualified service personnel.

The */etc/ttys* File

The following paragraphs describe the general format of the */etc/ttys* file. The discussions throughout this section show the specific changes you'll need to make to the file as you add peripherals and workstations. The */etc/ttys* file determines how the 8560 ports are configured at system startup. This file has the following format:

```
12tty0
12tty1
12tty2
12tty3
```

This file contains one line for each HSI port. Each line has the following format:

| | |
|----------------|--|
| Character 1 | When this character is a "1", you can log in at the port that is controlled by the line. When this character is "0" you cannot log in at the port. If the port is unused, this character should be a "0". |
| Character 2 | The second character determines the baud rate. For more information, see the following discussion, "Selecting the Baud Rate." If the port is jumpered for RS-422, or if character 1 contains a zero, character 2 is ignored. |
| Characters 3-5 | The letters "tty". |
| Character 6 | The HSI port number (0-7). |



*If your 8560 does not use all its HSI ports, be sure that the */etc/ttys* file contains no entries for the unused ports. Otherwise, the 8560 may crash.*

Selecting the Baud Rate

The second character of the */etc/ttys* file entry determines the baud rate a port uses. Table 2-1 shows how the baud rate is selected by the */etc/ttys* file entry.

Table 2-1
Baud Rate Selection in the */etc/ttys* file

| Second Character of <i>/etc/ttys</i> File Entry | Baud Rate Selected |
|---|-----------------------------------|
| A or a ^a | 9600 baud (fixed) |
| B or b ^a | 4800 baud (fixed) |
| C or c ^a | 2400 baud (fixed) |
| D or d ^a | 1200 baud (fixed) |
| E or e ^a | 600 baud (fixed) |
| F or f ^a | 300 baud (fixed) |
| 0 | variable rate, start at 9600 baud |
| 1 | variable rate, start at 4800 baud |
| 2 | variable rate, start at 2400 baud |
| 3 | variable rate, start at 1200 baud |
| 4 | variable rate, start at 600 baud |
| 5 | variable rate, start at 300 baud |
| 6 | variable rate, 1200 or 300 baud |
| 7 | variable rate, 300 or 1200 baud |

^a Use the lowercase letter when an 8540 or 8550 is connected to a port through RS-232-C protocol and you want to use TERM mode. The lowercase letter forces the port into HSI protocol.

Variable Baud Rate (0–7). If the second character of the file entry is a digit, TNIX tries to match the baud rate of the terminal. When you turn on your terminal, TNIX issues a login prompt. If the prompt does not appear correctly on your terminal, press the BREAK key and TNIX will try again at a different baud rate. Wait a few seconds for TNIX to change to a new baud rate before pressing the BREAK key again.

If the second character is a digit in the range 0–5, TNIX cycles through the baud rates 9600, 4800, 2400, 1200, 600, and 300. The starting baud rate is determined from Table 2-1. If character 2 is a “6,” TNIX tries 1200 baud, then 300, then 1200, then 300, and so on. A “7” has the same effect as a “6,” except that TNIX starts at 300 baud.

Initializing Ports

When the 8560 enters multi-user mode during the system startup, all ports are initialized according to the */etc/ttys* file. If you update */etc/ttys*, you can reinitialize the ports by logging into the *root* account and typing

```
# kill -2 1
```

This command does not affect other users’ ports.

CONNECTING A TERMINAL

The following paragraphs tell how to connect a terminal to the 8560 and how to configure the software to interface the terminal with the 8560.

NOTE

Before you read this discussion, your terminal should be set up and verified by qualified service personnel, as described in the terminal's installation manual.

Cable Connections

The terminal connects directly to an HSI port on the 8560's rear panel. The 8560 HSI port must be configured for RS-232-C protocol. Section 6 of this manual tells how to configure HSI ports with jumpers on the I/O Adapter Board.

CAUTION

I/O Adapter Board jumpers should be moved only by qualified service personnel.

/etc/ttys File Entry

In the `/etc/ttys` file, find the line that configures the port to which you plan to connect the terminal. The first character in that line must be a "1," and the second character must be either a digit or a capital letter. (Refer to Table 2-1.)

For example, the `1Ctty4` line in the `/etc/ttys` file configures HSI Port 4 for communication with a terminal at 2400 baud. The `12tty6` line configures HSI Port 6 for communication with a terminal. TNIX issues its login prompt at 2400 baud first. If you press the BREAK key, TNIX tries 1200 baud next, then 600, 300, 9600, 4800, and back to 2400.

CONNECTING AN 8540 INTEGRATION UNIT

NOTE

Before you read this discussion, your 8540 should be installed and verified by qualified service personnel as described in the 8540 Integration Unit Installation Guide.

An 8540 can be connected to an 8560 in several ways. The three most common 8560/8540 configurations are:

- 8560—RS-422—8540—terminal
- Terminal—8560—RS-422—8540
- 8560—modems—8540—terminal

The following paragraphs describe these configurations.

8560—RS-422—8540—Terminal

Figure 2-1 shows a simplified diagram of this configuration. In this configuration, the 8540 can operate in local mode or in TERM mode with the 8560.

Cable Connections

The terminal connects to the TERMINAL connector (J104) on the 8540's rear panel. The 8540 and 8560 communicate through a cable between an 8540 HSI port and an 8560 HSI port. The 8560 HSI port must be configured for RS-422 protocol. Section 6 of this manual tells how to configure HSI ports with jumpers on the I/O Adapter Board.

CAUTION

I/O Adapter Board jumpers should be moved only by qualified service personnel.

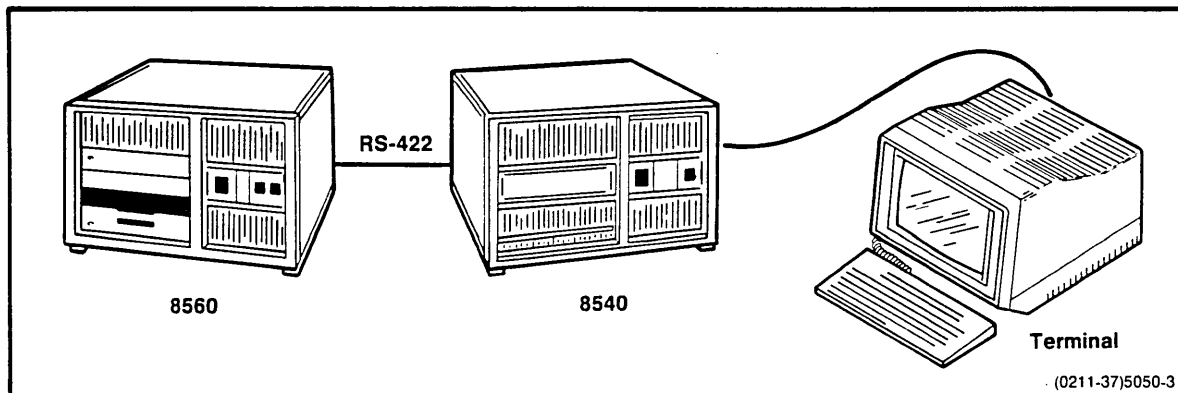


Fig. 2-1. 8560—RS-422—8540—terminal configuration.

/etc/ttyS File Entry

In the `/etc/ttyS` file, find the line that configures the port to which the 8540 is connected. Set the first character of that line to 1. The second character in the line has no effect on the port. Refer to Table 2-1.

Establishing Communication

Start up the 8540. Enter the OS/40 command `config term` to enter TERM mode. Log into the 8560.

Terminal—8560—RS-422—8540

Figure 2-2 shows a simplified diagram of this configuration. In this configuration, the 8540 can be controlled from any terminal attached to the 8560. Because the 8540 cannot operate in LOCAL mode in this configuration, the 8540 STARTUP command string must contain a `config term` command. To establish the STARTUP string, perform the following steps:

1. Temporarily connect a terminal to the 8540 and start the 8540 in LOCAL mode.
2. Enter the following lines to create the STARTUP string and store it in EEPROM:
 - > `STARTUP='config term'`
 - > `permstr -d STARTUP` [deletes old STARTUP, if any, from EEPROM]
 - > `permstr STARTUP`

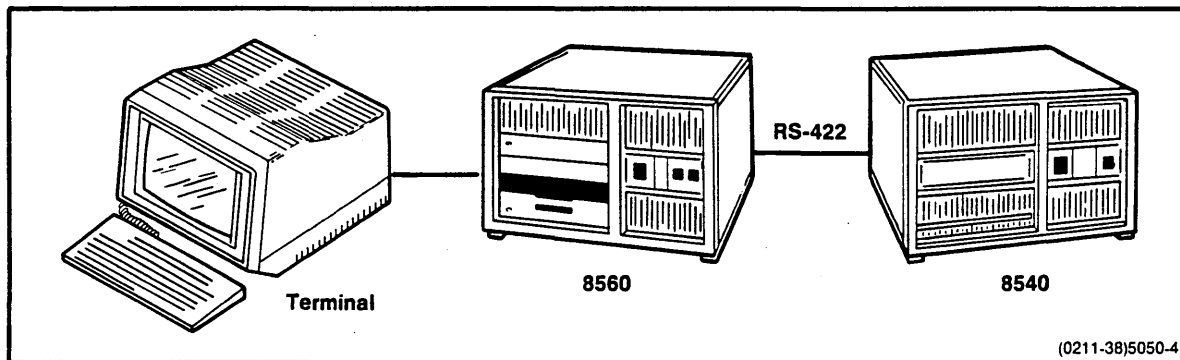


Fig. 2-2. Terminal—8560—RS-422—8540 configuration.

Cable Connections

The 8540 and 8560 communicate through a cable connecting the 8540 HSI port and the 8560 HSI port. The 8560 HSI port must be configured for RS-422 protocol. Section 6 of this manual tells how to configure the HSI ports with jumpers on the I/O Adapter Board.



I/O Adapter Board jumpers should be moved only by qualified service personnel.

/etc/ttys File Entry

In the `/etc/ttys` file, find the line that configures the port to which the 8540 is connected. Set the first character of that line to 0. The second character in the line has no effect on the port. Refer to Table 2-1 for baud rate selection in the `/etc/ttys` file.

Establishing Communication

Log into the 8560. To indicate which 8540 you want to use, enter the line `IU=n; export IU`, where "n" is the number of the HSI port to which the 8540 is connected. Start up the 8540. The STARTUP string automatically puts the 8540 into TERM mode.

8560—Modem—8540—Terminal

This configuration enables an 8540 and an 8560 at different sites to communicate through the 8540 COM command. Figure 2-3 shows a simplified diagram of this configuration. In order for you to use an 8540 with a modem, the 8540 must contain the optional COM Interface software.

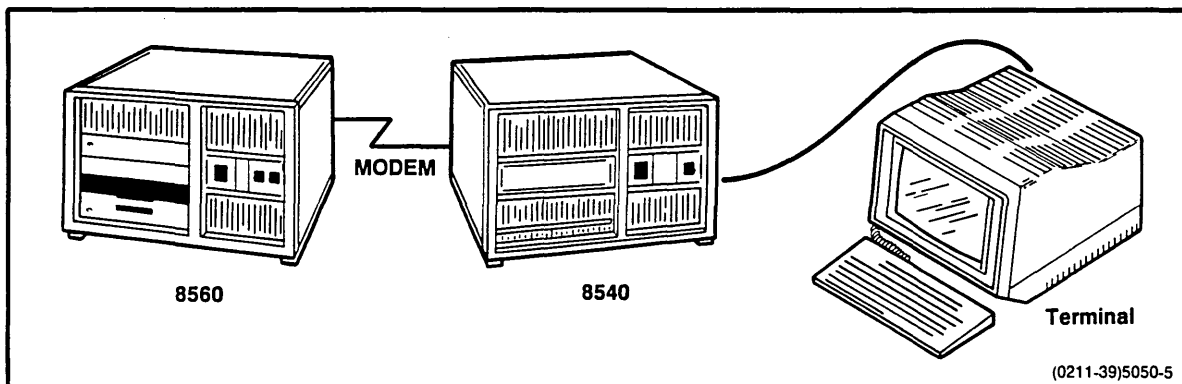


Fig. 2-3. 8560—modem—8540—terminal configuration.

Cable Connections

At the 8540 site, the terminal connects to the 8540 TERMINAL connector (J104), and the modem connects to J101 (male) or J102 (female). The REMOTE BAUD and MODE SELECT switches on the 8540 must match the modem requirements. These switches are explained in the *Intersystem Communication* section of the *8540 System Users Manual*.

At the 8560 site, the modem connects to an 8560 HSI port configured for RS-232-C protocol. Section 6 of this manual tells how to configure HSI ports with jumpers on the I/O Adapter Board.



I/O Adapter Board jumpers should be moved only by qualified service personnel.

/etc/ttys File Entry

In the */etc/ttys* file, find the line that configures the port to which the modem is attached. Set the first two characters of that line to 16 or 17. Refer to Table 2-1.

Establishing Communication

Start up the 8540. Enter the OS/40 **com** command, dial up the 8560, and log in.

CONNECTING AN 8550 MDL

NOTE

This discussion assumes that your 8550 has been properly installed and verified by qualified service personnel as described in the 8550 Installation Guide.

The two most common 8560/8550 configurations are:

- 8560—RS-232-C—8550—terminal
- 8560—modems—8550—terminal

Both configurations are described in the following paragraphs.

8560—RS-232-C—8550—Terminal

Figure 2-4 shows a simplified diagram of this configuration. In this configuration, the 8550 can operate in LOCAL mode or in TERM mode with the 8560. The suggested communication rate for this configuration is 2400 baud.

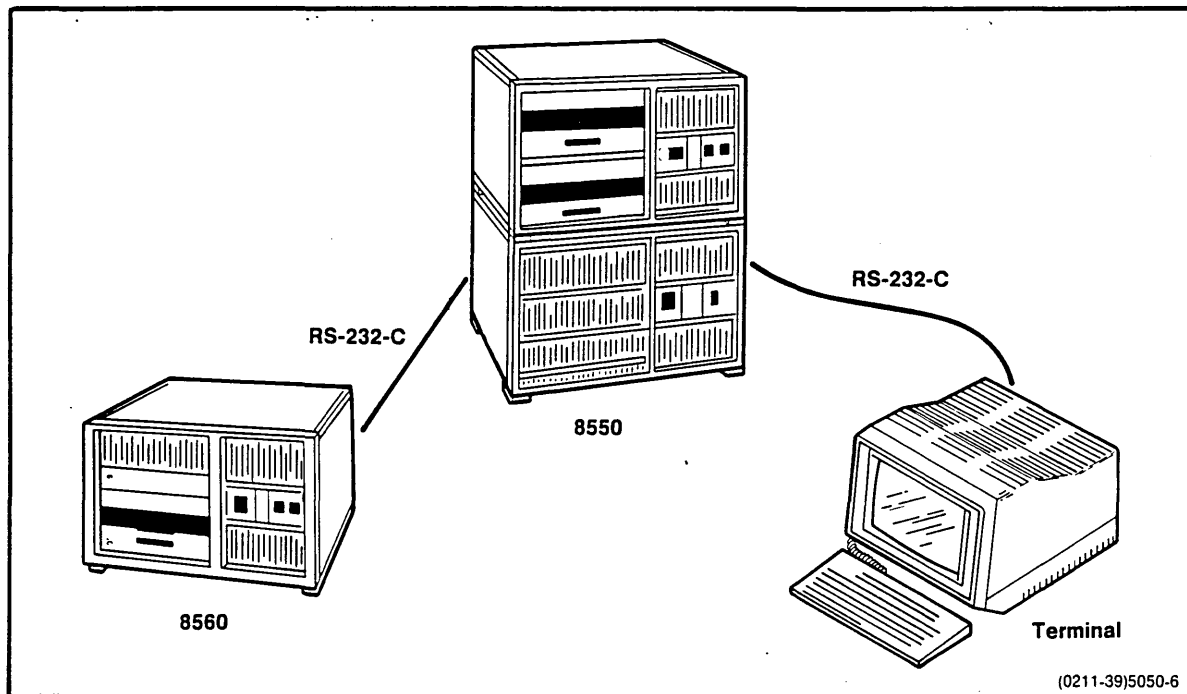


Fig. 2-4. 8560—RS-232-C—8550—terminal configuration.

Cable Connections

The terminal connects to the TERMINAL connector (J104) on the 8550's 8301 MDU. On the 8301, set the MODE SELECT switch to DTE1 and the REMOTE BAUD switch to 2400. The 8550 and 8560 communicate through a cable connecting the 8301 DTE connector (J101) to an 8560 HSI port configured for RS-232-C protocol. Section 6 of this manual tells how to configure HSI ports with jumpers on the I/O Adapter Board.

CAUTION

I/O Adapter Board jumpers should be moved only by qualified service personnel.

/etc/ttyS File Entry

In the `/etc/ttyS` file, find the line that configures the port to which the 8550 is connected. Set the first character of that line to 1. The second character in the line should be a lowercase "c" for 8560/8550 communication at 2400 baud. Refer to Table 2-1.

Establishing Communication

Start up the 8550. Enter the DOS/50 command **config term t=7** to enter TERM mode. Log into the 8560.

8560—Modem—8550—Terminal

This configuration enables an 8550 and 8560 at different sites to communicate through the 8550 COM command. Figure 2-5 shows a simplified diagram of this configuration.

Cable Connections

At the 8550 site, the terminal connects to the 8301's TERMINAL connector (J104), and the modem connects to J101 (male) or J102 (female). The REMOTE BAUD and MODE SELECT switches on the 8301 must match the modem's requirements. These switches are explained in the *Intersystem Communication* section of the *8550 System Users Manual*.

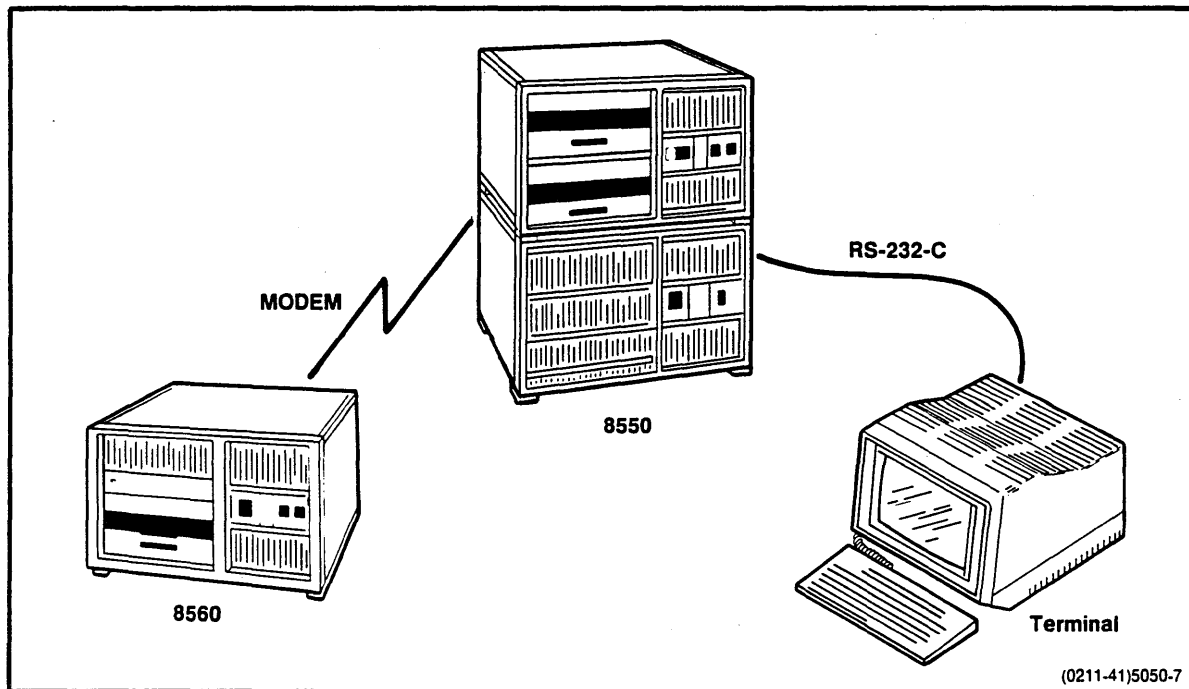


Fig. 2-5. 8560—modem—8550—terminal configuration.

At the 8560 site, the modem connects to an 8560 HSI port configured for RS-232-C protocol. Section 6 of this manual tells how to configure HSI ports with jumpers on the I/O Adapter Board.



I/O Adapter Board jumpers should be moved only by qualified service personnel.

/etc/ttyS File Entry

In the */etc/ttyS* file, find the line that configures the port to which the modem is attached. Set the first two characters in that line to either 16 or 17. Refer to Table 2-1.

Establishing Communication

Start up the 8550, and enter the DOS/50 **com** command with the appropriate parameters. Then dial up the 8560 and log in.

CONNECTING AND CONFIGURING A LINE PRINTER

NOTE

Before reading this discussion, the line printer to be installed should be unpacked and verified by qualified service personnel, as described in the line printer's installation manual.

The 8560 has two RS-232-C-compatible printer ports. Connecting and configuring a line printer involves three basic steps:

- Configure the line printer
- Connect the line printer
- Configure TNIX to interface with the line printer

Configure the Line Printer

Each line printer must be configured for RS-232-C protocol. Your line printers must use the RS-232-C serial communications protocol, set to the following specifications:

- 2400 baud
- 8-bit word structure
- One stop bit
- No parity

If your line printer cannot operate at 2400 baud, you can select a different baud rate by changing the interface jumpers on the 8560's Utility Board.

CAUTION

Baud rates should be changed only by qualified service personnel.

Connecting a Line Printer to Your 8560

One or two line printers may be connected directly to the LINE PRINTER connectors on the 8560 rear panel.

Connect your first line printer to the LINE PRINTER 1 Port (J805) using a 9-wire RS-232-C cable. Files are sent to this printer with the command

```
$ lpr filename
```

Connect your second line printer to the LINE PRINTER 2 Port (J810) using a 9-wire RS-232-C cable. Files are sent to this printer with the command

```
$ lp2r filename
```

Configure TNIX to Correctly Operate the Line Printer

TNIX expects your line printer to perform a carriage-return/linefeed (CR/LF) operation when a newline character (LF) is sent to the printer. If your printer requires a different code sequence to perform a CR/LF operation or does not correctly process tab characters, you can use the **slp** command to make TNIX send the proper character sequences (for newlines and tab processing) to your printer. Here are the **slp** command parameters that allow you to specify the character sequences that TNIX transmits to the line printers:

- The **nl** option tells TNIX that the line printer performs a CR/LF operation when it receives a linefeed.
- The **-nl** option tells TNIX to translate each linefeed character to a CR/LF character sequence when sending the file to the printer.
- The **nl=string** option tells TNIX to translate all linefeed characters to the characters contained in *string* while sending the file to the printer. With this option, you can specify the octal value for the characters in *string* by entering them as an escaped octal sequence; for example, you would enter the octal value 012 by typing "\012".
- The **tabs** option tells TNIX that the printer correctly processes tab characters.
- The **-tabs** option tells TNIX to translate all tab characters to the appropriate number of space characters when sending the file to the printer.

Once you have selected the proper options for the **slp** command, you can add the **slp** command to the */etc/rc* file. (The */etc/rc* file is executed each time you boot the 8560.)

Here are some **slp** command examples:

\$ slp /dev/lp1 nl tabs

Tells TNIX that line printer 1 (*/dev/lp1*) correctly processes tab characters and will perform a CR/LF operation whenever a linefeed character is sent to the printer.

\$ slp /dev/lp2 nl -tabs

Tells TNIX that line printer 2 does not correctly process tab characters but does perform a CR/LF operation whenever a linefeed character is sent to the printer.

\$ slp /dev/lp1 -nl -tabs

Tells TNIX that line printer 1 does not correctly process tab characters. This command line tells TNIX to replace any tab characters with the appropriate number of space characters and to replace any linefeed characters sent to the line printer 1 with the CR/LF sequence.

\$ slp /dev/lp1 nl='013\015' -tabs

Tells TNIX to replace any tab characters sent to line printer 1 with the appropriate number of space characters and to replace any ASCII LF characters sent to the printer with the ASCII characters VT and CR (octal 13 and octal 15).

For more information about the **slp** command, type **man slp**.

Section 3 SYSTEM MAINTENANCE COMMANDS

| | Page |
|------------------------------|------|
| Introduction | 3-1 |
| Notational Conventions | 3-2 |
| cvt | 3-3 |
| dump | 3-8 |
| format | 3-11 |
| mkboot | 3-13 |
| mkfs | 3-14 |
| restor | 3-18 |
| syschk | 3-21 |
| Messages | 3-22 |

TABLES

| Table No. | | Page |
|-----------|--------------------------------------|------|
| 3-1 | Magnetic Tape Block Capacities | 3-9 |

Section 3

SYSTEM MAINTENANCE COMMANDS

INTRODUCTION

Section 1 of this manual included several system maintenance procedures performed by the system manager. This section describes the seven essential commands used in these maintenance procedures:

| | |
|---------------|--|
| cvt | Adjusts low-level TNIX kernel parameters. |
| dump | Makes backup copies of filesystems on magnetic tape or flexible disks. |
| format | Formats fixed or flexible disks. |
| mkboot | Copies the program that boots TNIX to the first block on the 8560's internal fixed disk. |
| mkfs | Creates a new filesystem on a disk. |
| restor | Restores complete filesystems or individual files from backups. |
| syschk | Checks filesystem integrity and corrects filesystem problems. |

With the exception of **dump** and **mkboot**, these commands exist in two forms:

- The standard TNIX version of each command is used to obtain status information or perform operations that do not affect the root filesystem. The root filesystem is described in Section 1 of this manual.
- The Standalone Utilities version of each command is used to perform operations that affect the root filesystem or directly affect how the TNIX kernel operates.

The **dump** command is a standard TNIX command and has no Standalone Utilities version.

The **mkboot** command appears only on the Standalone Utilities Disk.

You can obtain online information for most TNIX commands by using the **man** and **index** commands. However, online information is **not** available when you are using the Standalone Utilities commands. Therefore, this section provides you with complete information about these commands.

NOTATIONAL CONVENTIONS

This section uses the following notational conventions:

- In command syntax descriptions, literal strings of characters are printed in **bold** type; strings in *italic* type represent variable parameters. Character strings enclosed with [square brackets] are optional command parameters.
- In command examples, text that you type is underlined; text that is displayed on your terminal is not underlined.
- Comments are enclosed in (parentheses).
- The notation <CTRL-D> tells you to simultaneously press the key marked “CTRL” (for “control”) and type a “D”.

Unless otherwise specified, all references to the 8560 refer to the 8561 and 8562 as well.

SYNTAX**cvt** [-w] [-f *tnixname*] [*script*]**PARAMETERS**

-w Write the new parameters. Without the **-w** option, **cvt** can only be used to examine the current TNIX configuration or check that the new parameters are compatible with the current system hardware configuration. The **-w** option establishes the new parameters within TNIX.

-f *tnixname* Examine or modify *tnixname*, rather than the default kernel (*/tnix*).

script A file that contains lines directing **cvt** to examine or set various TNIX kernel parameters. If the file you specify for *script* cannot be found in the current directory and does not begin with a slash, **cvt** checks for *script* in the */etc/cvtscrip*t directory. If you don't specify *script*, **cvt** takes its input from the standard input. If you use standard input, terminate **cvt** by typing **<CTRL-D>**.

Within the *script* file, blank lines and lines beginning with a pound sign (#) are ignored. Lines beginning with an exclamation point (!) are passed to the shell for execution. All other lines must be of the form:

parameter

or

parameter value

Parameter is the name of the parameter to be set or examined, and *value* (if specified) is the new value for the parameter. If you don't specify *value*, **cvt** prints the current value of *parameter*.

NOTE

*Because **cvt** deals with the low-level configuration parameters of the kernel, it is possible to generate a kernel that will not run properly. The use of configuration scripts is encouraged.*

EXPLANATION

The **cvt** command, named after an internal TNIX data structure called the “Configuration Variable Table,” alters three sets of TNIX kernel parameters:

- Data structure size parameters. These parameters establish sizes for various data structures within the kernel.
- Root device parameters. These parameters describe the root filesystem configuration, and must be altered whenever you change the size of the root filesystem. (The root filesystem always begins on the 8560’s internal fixed disk).
- Time parameters. These parameters enable TNIX to properly compute local times and dates.

The following paragraphs describe these three sets of kernel parameters.

Data Structure Size Parameters

| | |
|--------|--|
| buffer | The total number of I/O buffers. Most disk I/O occurs indirectly through these buffers. The default value for this parameter is 20; you can increase the value up to 30 (if you have enough memory). Having more buffers increases the disk I/O throughput, thereby increasing the performance of disk-intensive programs. However, the search time for all programs will also increase. |
| inode | The total number of active inode table entries. Each table entry identifies a unique, active (open) file. The default value for <i>inode</i> is 62. If your system often reports “file table overflow” or “inode table overflow” errors, you should increase this value (if you have enough memory). If you increase this parameter, you must also increase the <i>file</i> parameter proportionally. |
| file | The total number of open file table entries. This parameter is similar to the inode parameter, except that table entries occur for each instance that a file is opened. For example, if three independent processes opened the same file, there would be one entry in the active inode table and three entries in the active file entry. (However, if the processes were forked from a common parent, they will share a common open file table entry.) The default value for <i>file</i> is 80; the value must always be greater than or equal to the inode parameter value. |
| proc | The total number of process table entries. This table contains one entry for each process; each entry contains all information the system needs about a process while the process is swapped out of primary memory. The size of this table determines how many processes may exist within the system at one time. The default value for <i>proc</i> is 50; the value must always be greater than or equal to the value for the <i>text</i> parameter, and less than or equal to the value for the <i>swapmap</i> parameter. |

| | |
|---------|--|
| mount | The maximum number of mount table entries. This table contains one entry for each mounted device. (TNIX expects the mount table to include the root device, even though the mount and umount commands do not affect the root device.) The default value for <i>mount</i> is 4; you can decrease this value to gain a little extra memory space if you have fewer than 3 mountable (non-root) filesystems. The parameter must always be 1 or greater. |
| text | The maximum number of text table entries. This table contains one entry for each current read-only text (code) segment. Each entry contains a segment's address in primary and secondary memory, and a reference count that indicates how many processes share the segment. The default value for <i>text</i> is 25; the value must always be less than or equal to the value for the <i>proc</i> parameter. |
| swapmap | The maximum number of swap map entries. Each entry identifies a discontinuous section of the swap space located on the root device. As a result, the <i>swapmap</i> parameter sets the maximum fragmentation of the swap space. The default value for <i>swapmap</i> is 60; the value must always be greater than or equal to the value for the <i>proc</i> parameter. |
| coremap | The maximum number of core (primary memory) map entries. Each entry identifies a discontinuous section of available user memory. As a result, the <i>coremap</i> parameter sets the maximum fragmentation of the memory. The default value for <i>coremap</i> is 60. |

Root Device Parameters

| | |
|---------|--|
| rootdev | Two integers, separated by a tab or space character, that specify the major and minor device numbers of the root device. The major device number must be 0. The minor device number must be 0 (for <i>/dev/hd0</i>), 8 (for <i>/dev/hd01</i>), 16 (for <i>/dev/hd02</i>), or 24 (for <i>/dev/hd03</i>). |
| swapdev | The major and minor device numbers of the swap device. These values must be identical to the values of the <i>rootdev</i> parameter because TNIX allows the swap space to exist only on the root device. |
| pipdev | The major and minor device numbers of the pipe device. These values must be identical to the values of the <i>rootdev</i> parameter. |
| nswap | If the total number of available blocks on the root filesystem is less than 30,000, 2,250 blocks must be reserved for swap space. If the total available blocks exceeds 30,000, reserve 4,576 blocks for swap space. If you want to increase the space available for swapping, increase the <i>nswap</i> parameter and decrease the <i>swplo</i> parameter, so the total of <i>nswap</i> and <i>swplo</i> equals the total number of blocks available on the device. |

swplo The starting block of the swap space on the root device. This block number marks the boundary between the root filesystem and the swap space. Make sure the total of *nswap* and *swplo* equals the total number of blocks available on the device.

CAUTION

*Be sure to do a complete dump of the root filesystem before changing the *nswap* and *swplo* parameters; a larger swap space may overrun existing files. After you have modified these parameters, execute *mkfs*, setting the *mkfs* blocks parameter to the value of the *swplo* parameter. Then restore your root filesystem.*

Time Parameters

timezone The offset in minutes from Greenwich Mean Time to the current timezone. For example, if you are in the Pacific Standard Time zone, the value for *timezone* is 480.

tzname The three-character name of the current timezone. For example, EST means Eastern Standard Time.

tzdstname The three-character name of the current timezone during daylight savings time. For example, PDT means Pacific Daylight Time.

tzflag Indicates whether daylight savings time is in effect. The value for *tzflag* may be "1" for daylight savings time, or "0" for standard time.

Using **cvt**

Use the Standalone Utilities version of **cvt** when you change the configuration of the root filesystem. Use the standard version of **cvt** in other circumstances.

Shut down and reboot the 8560 after you reconfigure */tnix*, so that the new TNIX will be loaded into memory.

EXAMPLES

```
fbr filename to boot>cvt
cvt arguments: -w
rootdev 0 8
swapdev 0 8
pipdev 0 8
nswap 4576
swplo 134576
<CTRL-D>
```

In this example, the **cvt** command on the Standalone Utilities Disk reconfigures the TNIX kernel code in */tnix* to accommodate a root filesystem mounted on two fixed disks.

```
# cvt -w -f newtnix root01
```

In this example, the standard TNIX **cvt** command reconfigures the TNIX kernel code in */newtnix* to accommodate a root filesystem mounted on two fixed disks. (This example assumes that */newtnix* was previously copied from */tnix*.) The file *root01* is a script that contains the necessary configuration parameters. Once you are sure that */newtnix* is properly configured, move */newtnix* to */tnix* and reboot your system.

```
# cvt -w tzflag 1
```

In this example, the standard TNIX **cvt** command informs TNIX that daylight savings time is in effect.

```
# cvt  
.
```

In this example, the standard TNIX **cvt** command displays the current settings of the internal TNIX parameters.

ERROR MESSAGES

preposterous cvt address

Tnixname is not in the appropriate format.

SYSTEM TOO BIG: number BYTES OVER

The new configuration will not fit into the available memory. Try reducing one of the data structure size parameters, or installing additional memory in your system.

Other messages are self-explanatory.

FILES

/tnix The default tnix kernel.

/etc/cvtscript The directory that contains distributed **cvt** scripts.

SEE ALSO

For more information about Standalone operation, refer to Section 1 of this manual.

SYNTAX

```
dump [level [u] logical-device] [-f dumpdev] [-s blocksize] [-m] [-v]
```

PARAMETERS

- level* A single decimal digit (in the range 0 through 9) that specifies the “dump level.” All files on a logical device that have been modified since the last dump of a lesser level (as determined by the date stored in the file */etc/ddate*) are dumped. Selecting level 0 dumps the entire logical device.
- u* Writes the beginning date of a successful dump into the */etc/ddate* file. This file records the last date a dump occurred at each dump level for each logical device.
- logical-device* The pathname of the device that contains the filesystem you want to dump; the pathname must begin with */dev/*. You should use the “raw” name for a particular device to minimize the time required for the dump. For example, if the root filesystem is located on the 8560’s internal disk, use logical device name */dev/rhd0* to dump the root filesystem; do not use */dev/hd0*.
- f** *dumpdev* Specifies the complete pathname of the dump device (the device upon which the dump will be written). Typically this device is a flexible disk drive or magnetic tape unit; however, any TNIX special file or regular file may be specified. (The file must exist and must have the appropriate protection mode.) If you do not specify *dumpdev*, the files are dumped to */dev/rfd0* (the flexible disk drive).
- s** *blocksize* Specifies the size (in blocks) of the dump medium. If you do not specify *blocksize*, **dump** assumes that you’re dumping to 1995-block volumes.
- m** Causes **dump** to write and read back a test record on the target medium before attempting a dump. This option gives you the opportunity to replace a bad or improperly mounted volume without restarting the dump procedure.
- v** Causes **dump** to verify that each volume can be read, after the volume is completely written. When you include **-v** in the command line, **dump** automatically includes the **-m** option as well.

Entering the **dump** command without specifying arguments is equivalent to entering:

```
# dump 9u /dev/rhd0 -f /dev/rfd0 -s 1995
```

EXPLANATION

Dump copies all files that have changed after a certain date from *logical-device* to flexible disk(s) or magnetic tape(s). During execution, **dump** displays:

- The current date
- The earliest date at which the dump starts (the earliest possible date if this is a level-0 dump)
- The source and destination devices of the dump
- When each of the four internal steps of the dump procedure begins

You must install the first dump volume before you invoke **dump**. If the dump requires more than one volume (a single flexible disk or magnetic tape), **dump** asks you to change volumes. After changing the volume, press the RETURN key.

Dump Volume Capacities

Single-density flexible disks have a 500-block capacity. Double-density flexible disks have a 1995-block capacity.

A magnetic tape's block capacity depends on the tape length (in feet) and the type of tape used (reel-to-reel or cartridge). Table 3-1 shows the maximum block capacities **dump** allows for different tape lengths and types. (If you are not certain how accurate a tape's declared length is, decrease your estimate of the tape's block capacity.)

Table 3-1
Magnetic Tape Block Capacities

| Tape Type and Length | Block Capacity |
|----------------------|----------------|
| Cartridge Tapes | |
| 300 Feet | 5180 |
| 600 Feet | 7770 |
| Reel-to-Reel Tapes | |
| 600 Feet | 15930 |
| 1200 Feet | 30940 |
| 2400 Feet | 62740 |

EXAMPLES

```
# dump Ou /dev/rhd0
```

In this example, **dump** performs a complete backup of a root filesystem onto flexible disks, and updates the appropriate entry in */etc/ddate*. The example assumes that the entire root filesystem resides on one disk.

```
# dump Ou /dev/rhd23
```

In this example, **dump** performs a complete backup of the non-root filesystem */dev/rhd23* onto flexible disks and updates the appropriate entry in */etc/ddate*.

```
# dump Ou /dev/rhd1 -f /dev/mt0 -s 10000 -v
```

In this example, **dump** performs a complete backup of */dev/rhd1* onto 10,000-block magnetic tapes; the tape drive is named */dev/mt0*. The command verifies each tape before and after the tape is written and updates the appropriate entry in */etc/ddate*.

```
# dump lu /dev/rhd01 -f /dev/mt0 -s 20000 -m
```

In this example, **dump** performs a partial backup of a two-disk root filesystem onto 20,000-block magnetic tapes. The tape drive is named */dev/mt0*. Only those files that have changed since the last level 0 dump are transferred to the tape. The command verifies each tape before and after the tape is written and updates the appropriate entry in */etc/ddate*.

```
# dump 8u /dev/rhd0
```

In this example, **dump** performs a partial backup of the root filesystem onto flexible disks. Only those files that have changed since the last level 7 (or earlier) dump are transferred to the disks. The command updates the the appropriate entry in */etc/ddate*.

ERRORS

Read errors on *logical-device* are ignored. Write errors on the dump volume(s) are usually fatal. Try performing the dump again with a different dump volume.

FILES

/etc/ddate Records the dump dates of each filesystem at various dump levels.

SEE ALSO

Type **man dumpdir** for a description of the **dumpdir** command. **Dumpdir** lists the directories and files on a dump volume.

For information about the **restor** command used to restore files and filesystems, refer to the **restor** command description in this section.

For more information on performing complete or incremental filesystem backups, refer to Section 1 of this manual.

To read the online manual page about data formats on dump volumes, type: **man 5 dump**.

SYNTAX

format (Standalone Utilities version for fixed disks) (Prompts for optional *drive* number)

or

format [-s] (standard TNIX version, for flexible disks)

PARAMETERS

- s** Formats a **single**-density flexible disk. (The default is to format **double**-density flexible disks.)
- drive* Formats the specified fixed disk drive. The values for *drive* may be 0, 1, 2, or 3 (logical devices */dev/rhd0*, */dev/rhd1*, */dev/rhd2*, and */dev/rhd3*, respectively).

EXPLANATION

If the contents of a fixed disk drive become corrupted, it may be necessary to reformat the disk. You should try correcting the problem with **syschk** first, however, because **syschk** can solve most problems of this type. If **syschk** cannot repair the disk, the Standalone Utilities version of **format** redefines various logical fields in each fixed disk sector, such as ID fields and data fields. After you reformat the disk, use the **mkfs** command to create a new filesystem on the disk, and then run **syschk** to verify the filesystem's integrity. Once a usable filesystem exists on the disk, you can restore files with the **restor** command. Be sure to reinstall the boot block with the **mkboot** command.

The standard TNIX **format** command functions analogously for flexible disks. Always format flexible disks before attempting to use them. (Be sure that the write-protect slot is covered by a piece of tape or similar opaque material.)

CAUTION

Format destroys any data on the specified disk. Be sure you have backup copies of any valuable data before using format.

EXAMPLES

```
fbr filename to boot> format
format arguments: 0
```

In this example, the **format** command on the Standalone Utilities Disk formats the internal 8560 fixed disk. **Format** destroys all previous data on the fixed disk.

```
fbr filename to boot> format  
format arguments: 1
```

In this example, the **format** command on the Standalone Utilities Disk formats the first of any additional disks attached to your system. Before booting the Standalone Utilities Disk to execute **format**, perform a complete backup of the filesystem that includes the additional disk(s). **Format** destroys all previous data on the second hard disk.

```
# format
```

In this example, **format** formats a double-density flexible disk. The system must be in single-user or multi-user mode.

```
# format -s
```

In this example, **format** formats a single-density flexible disk. The system must be in single-user or multi-user mode.

FILES

/dev/rfd0 The 8560 flexible disk drive's name.

*/dev/rhd** Names for fixed disks within the 8560 and additional hard disks.

SEE ALSO

Refer to the descriptions of the **mkboot**, **mkfs**, **restor**, and **syschk** commands in this section. You must use these commands after you format a fixed disk.

For more information about Standalone operation, refer to Section 1 of this manual.

SYNTAX**mkboot****EXPLANATION**

The **mkboot** command installs the boot block in block 0 of the 8560's internal fixed disk.

The **mkboot** command resides on the Standalone Utilities Disk. You must place the system in standalone mode before reinstalling the boot block. When **mkboot** executes, it searches the flexible disk for a file named *pmuboot*. If this file exists, **mkboot** copies its first block to block 0 of the fixed disk.

EXAMPLES

```
fbr filename to boot> mkboot
```

In this example, the **mkboot** command on the Standalone Utilities Disk copies a new boot block onto the 8560's internal fixed disk.

ERROR MESSAGES

'cannot find pmuboot'

Mkboot issues this message if the boot file is not on the Standalone Utilities Disk. Other error messages are similar to those generated by **fbr**.

SEE ALSO

For information about the **fbr** command, type: **man fbr**.

For information about the **format** command used to initialize disks, refer to the **format** command description in this section.

For more information about Standalone operation, refer to Section 1 of this manual.

SYNTAX

mkfs (Standalone Utilities version)

or

mkfs *logical-device blocks* (standard TNIX version)

PARAMETERS

logical-device The special file name associated with the physical disk drive. For example, */dev/hd1* is the name of a logical device associated with a non-root filesystem on any additional disk(s).

blocks The number of blocks (decimal) on the logical device. (The Standalone Utilities version of **mkfs** also expects you to specify the number of blocks. Enter this parameter when Standalone **mkfs** prompts you for arguments.) Refer to the next procedure, "Filesystem Configuration Record," which explains how these parameters are derived.

FILESYSTEM CONFIGURATION RECORD

Upon execution of the standalone **mkfs** command, a list of the number of available blocks for the devices on your system will be displayed on the terminal.

Use the *Filesystem Configurations Record Sheet* that follows this explanation to configure the total number of blocks available in both your root filesystem and any additional filesystems you may establish.

After **mkfs** has displayed the total number of available blocks for each of the drives in your system, record each of these values on the lines entitled *"/dev/hd0"* through *"/dev/hd3"* on the *Filesystem Configurations Record Sheet*.

If the total allotment of available blocks for your root filesystem is less than 30,000, reserve 2,250 blocks for swap space. If the total allotment of available blocks for your root filesystem equals or exceeds 30,000, reserve 4,576 blocks for swap space. Enter the appropriate swap space allocation on the line entitled, "Less: Blocks reserved for swap space."

Subtract the value entered for swap space from the total blocks available for the root filesystem and enter this value in "Total # of blocks in root filesystem."

If you have additional filesystems, enter the allocation of available blocks for each filesystem on the line(s) provided for "Total # of blocks in optional filesystems."

WARNING

*The number you derive for the total number of blocks available in your root filesystem must correspond to the **swplo** value you establish when executing the **cvt** command.*

*The number of blocks reserved for swap space must correspond to the **nswap** value you establish when executing the **cvt** command.*

| FILESYSTEM CONFIGURATION RECORD SHEET | | | | |
|--|-------|--|------------|------------|
| # of Blocks on Device | | | | |
| /dev/hd0 | _____ | | | |
| /dev/hd1 | _____ | | | |
| /dev/hd2 | _____ | | | |
| /dev/hd3 | _____ | | | |
| MAXIMUM BLOCKS IN EACH FILESYSTEM | | | | |
| | ROOT | OPTIONAL 1 | OPTIONAL 2 | OPTIONAL 3 |
| Total Blocks Available for Root Filesystem | _____ | | | |
| Less: Blocks Reserved for Swap space | _____ | | | |
| | | (Note: This value must be the same as the nswap parameter for cvt .) | | |
| Total Blocks in Root Filesystem (mkfs Argument) | _____ | | | |
| | | (Note: This value must be the same as the swplo parameter for cvt .) | | |
| Total Blocks in Optional Filesystems (mkfs Argument) | _____ | _____ | _____ | _____ |

EXPLANATION

The **mkfs** command constructs an empty filesystem on the specified *logical-device*. **Mkfs** creates a default number of inodes in the filesystem, based upon the number of *logical-device* blocks available.

The Standalone Utilities version of **mkfs** is used to create the root filesystem (the filesystem that begins on fixed disk drive 0). You must boot the system from the Standalone Utilities Disk to use this version of **mkfs**.

NOTE

*If you change the size of the root filesystem, you must reconfigure your system with the **cvt** program.*

The standard TNIX version of **mkfs** is used to create any non-root filesystem. Be sure to unmount the filesystem first.

CAUTION

***Mkfs** destroys any data on the specified disk. Be sure you have backup copies of any valuable data before using **mkfs**.*

EXAMPLES

```
fbr filename to boot> mkfs  
hd0 = 69576 blocks  
mkfs arguments: 65000
```

In this example, the **mkfs** command on the Standalone Utilities Disk creates a root filesystem on an 8560's internal fixed disk (*/dev/hd0*). The argument specified for **mkfs** indicates the number of disk blocks available for the root filesystem (4,576 blocks reserved for swap space.)

```
fbr filename to boot> mkfs  
hd0 = 26610 blocks  
mkfs arguments: 24360
```

In this example, the **mkfs** command on the Standalone Utilities Disk creates a root filesystem on an 8560's internal fixed disk (*/dev/hd0*). The argument specified for **mkfs** indicates the number of disk blocks available for the root filesystem (2,250 blocks reserved for swap space.)

```
fbr filename to boot> mkfs  
hd0 = 69,576 blocks  
hd1 = 69,576 blocks  
mkfs arguments: 134576
```

In this example, the **mkfs** command on the Standalone Utilities Disk creates a root filesystem on an 8560's internal fixed disk and a second hard disk (*/dev/hd1*). The argument specified for **mkfs** indicates the number of disk blocks available for the root filesystem (4,576 blocks reserved for swap space.)

```
# mkfs /dev/hd1 69576
```

In this example, the standard TNIX **mkfs** command creates a filesystem on a second hard disk */dev/hd1*. The system must be in single-user or multi-user mode.

SEE ALSO

For information about the **cvt**, **mkboot**, **restor**, and **syschk** commands, refer to the respective command descriptions in this section. The **cvt** command adjusts various kernel parameters that vary directly with the **mkfs** *blocks* parameter. The other three commands are used with **mkfs** to restore a corrupted disk to a usable condition or to prepare a new disk for use with TNIX.

Type **man mount** and **man umount** for information about commands to mount and unmount removable filesystems.

To read the online manual page about TNIX's filesystem structure, type **man 5 filsys** or **man 5 dir**.

For more information about Standalone operation, refer to Section 1 of this manual.

SYNTAX

restor [-f *mt*(*type,addr*)] (Standalone Utilities version)

or

restor [-f *device*] -rxt [*filename...*] (standard TNIX version)

PARAMETERS

-f
mt(*type,addr*) Specifies the magnetic tape unit that contains the dump volume. The *type* parameter must be either a "0" (indicating a Dylon 2001/9001 7/9 track Magnetic Tape System) or a "1" (indicating a Dylon 4000A Digital Cartridge Recording System). The *addr* parameter specifies the tape drive's primary address on the GPIB.

This option applies only to the Standalone Utilities version of **restor**. Enter the option when **restor** prompts you to enter arguments. If you simply press the RETURN key without specifying this option, **restor** assumes that */dev/rfd0* (the 8560's flexible disk drive) contains the dump volume.

-f device Specifies the complete pathname of the device containing the dump volume. Typically this device is a flexible disk drive or magnetic tape unit; however, you may specify any TNIX special file or regular file. (The file must exist and must have the appropriate protection mode.) If you do not specify **-f device**, **restor** assumes that */dev/rfd0* contains the dump volume.

This option applies only to the standard version of **restor**.

-r filename Writes the dump volume's contents into the filesystem specified by *filename*. This operation recreates a filesystem from either full or incremental backups. Unmount *filename* before performing the restore operation.

This option applies only to the standard TNIX version of **restor**, and can only be used to restore a non-root filesystem. Use the Standalone Utilities version of **restor** to restore the root filesystem from backups.

-x filename Extracts each *filename* from the dump volume, and places *filename*'s contents into a file in the current directory. The resulting file is named with *filename*'s inode number. You can use this option to restore files on root or non-root filesystems.

NOTE

*Do not try to individually restore critical system files, such as special files (/dev/ *) or /tnix, with the -x option.*

-t Prints the date the volume was written and the date the filesystem was dumped.

EXPLANATION

The **restor** command reads flexible disks or magnetic tapes dumped with the **dump** command. (These flexible disks or magnetic tapes are known generically as *dump volumes*.) The Standalone Utilities version of **restor** restores files on the root filesystem. The standard TNIX version of **restor** restores non-root filesystems and restores individual files on any filesystem. You can use this standard version of **restor** in either single-user or multi-user mode.

If you are restoring a filesystem from more than one dump volume, **restor** will ask you to change volumes when the contents of the previous volume have been restored. Press RETURN when you have installed the next volume.

CAUTION

Restoring a complete dump to a filesystem will destroy any information previously on that filesystem.

EXAMPLES

```
# umount /usr1; restor -f /dev/rfd0 -r /usr1
```

In this example, **umount** unmounts the */usr1* filesystem. The **restor** command then copies the contents of one or more dump volumes onto the */usr1* filesystem.

```
# restor -f /dev/rfd0 -t
```

In this example, **restor** prints a dump volume's date and dump level. You must install the dump volume into the flexible disk drive before you enter this command.

```
fbr filename to boot> restor  
restor arguments: -f mt(0,4)
```

In this example, the **restor** command on the Standalone Utilities Disk restores the root filesystem from a Dylon Corporation 2001/9001 7/9 track magnetic tape unit when using the GPIB interface. The tape unit is located at GPIB primary address 4. The first line shows the actual **restor** command. The second line shows the **restor** command's request for additional command arguments, and the arguments you enter to specify the tape drive.

ERROR MESSAGES

Restor may generate various error messages about reading the dump volume and writing the fixed disk. **Restor** also prints error messages if the i-list or the free list of the file system is not large enough to hold the dump.

FILES

*rst** Temporary files used by **restor**.

SEE ALSO

For more information about the **dump** command, refer to the command description in this section.

To read the online manual page about the **dumpdir**, **mount**, **settape**, and **umount** commands, type **man commandname**. These commands are often used to obtain status information or to provide temporary system configurations for file restoration procedures.

For more information about Standalone operation, or about restoring complete filesystems or individual files, refer to Section 1 of this manual.

SYNTAX

```
syschk [-bmw] [-t tempdir] [filesystem...]
```

PARAMETERS

- b** Scans for and removes bad blocks from *filesystem*. The **-b** option automatically includes the **-m** option. **Syschk**'s default is not to scan for bad blocks. As many bad blocks as possible (up to one per track) are removed by formatting the bad track(s). **Syschk**'s method of formatting tracks preserves any good data that was on the track prior to formatting. Any bad blocks remaining after formatting are allocated to the bad block inode (i-number 1) and deallocated from their original structure.
- m** Allows modifications (repairs) to be made to *filesystem*. **Syschk**'s default is not to attempt to repair any faults it finds in the file system.
- The filesystem being repaired must be unmounted (with the **umount** command) before you use the **-m** or **-b** options.
- w** Displays warnings. **Syschk**'s default is not to warn of unusual file system conditions that are not necessarily errors.
- t tempdir** Places temporary files in *tempdir* rather than in the default directory, */tmp*. The Standalone Utilities version of **syschk** ignores this option.
- filesystem* The filesystem to be checked. If you do not specify *filesystem*, **syschk** checks the filesystems listed in the file */etc/checklist*, or the root filesystem, if */etc/checklist* does not exist. (You must use the Standalone Utilities version to make corrections to the root filesystem, however.)

EXPLANATION

For each *filesystem* you specify, **syschk** performs a number of checks on the integrity of that filesystem. The standard TNIX version of **syschk** checks any filesystem, and repairs any filesystem that is not currently mounted. The Standalone Utilities version of **syschk** enables you to repair the root filesystem (the filesystem beginning on the 8560's internal fixed disk), which is always mounted whenever TNIX is running.

A single filesystem corruption may result in several errors, all of which disappear when the corruption is repaired. For example, a block allocation problem involving a directory may cause many link count errors that disappear when the block allocation problem is corrected.

The standard TNIX version of **syschk** exits with a status of “0” if no problems, “1” if some file system corruption was detected, or other values if some other problem occurred, such as invocation of **syschk** with an illegal option. The Standalone Utilities version completes after displaying the message:

```
syschk complete. halt or reboot.
```

Syschk can only make reasonable guesses concerning the cause of a set of filesystem corruptions. The files that **syschk** offers to remove should first be examined to avoid unnecessary file deletion.

EXAMPLES

```
fbr filename to boot>syschk  
syschk arguments: -bw
```

In this example, the Standalone Utilities version of **syschk** checks the integrity of the root filesystem, displays warnings about unusual file conditions, and attempts to repair any filesystem irregularities.

```
# syschk -w
```

In this example, the standard TNIX version of **syschk** checks the integrity of all filesystems listed in the */etc/checklist* file. **Syschk** displays warnings but does not attempt to correct any irregularities. Unmount the filesystems listed in */etc/checklist* before executing this command.

MESSAGES

The following pages provide a list of **syschk**'s responses to filesystem corruptions. When a message ends in a question mark, you can choose not to perform the given repair by typing an “n” or pressing the RETURN key. Any message regarding a particular inode (file) is preceded by the name of the file (as well as can be determined), the size and protection mode of the file, the name or user ID of the file's owner, and the times associated with the file (given in GMT by the Standalone Utilities version of **syschk**, and in local time by the standard TNIX version). Any message regarding a corrupt link is preceded by the same information (about the directory involved) and the name of the link.

Any errors described here as “fatal” are severe enough that further checking of the filesystem is pointless. **Syschk** cannot repair such a filesystem. The filesystem must be completely restored from the most recent backup, using **restor**.

ASSOCIATED I-NODE IS UNALLOCATED remove entry? The given directory entry refers to a deleted file. **Syschk** is offering to remove the offending link.

BAD BLOCK I-NODE IS NOT A REGULAR FILE put one there? The inode dedicated to storing bad blocks should be an ordinary file, but isn't. **Syschk** is offering to rewrite that inode with one representing an ordinary file.

BAD COUNT IN FREELIST BLOCK rebuild free list? The free list is corrupt. More precisely, the “number of blocks pointed to by this block” field in a free list block is negative or is greater than the maximum allowed. **Syschk** is offering to replace the free list with a good one.

BAD MODE destroy? The given file is allocated, but it is not one of the following types: directory, regular file, character special file, block special file. **Syschk** is offering to deallocate the file, destroying its contents.

BAD SIZE destroy? The size of the given file does not make sense (is negative or greater than what can be represented). **Syschk** is offering to deallocate the file, destroying its contents.

BAD SUPERBLOCK UPDATE TIME time update? The superblock's (block 1 on the disk device) indication of the last time it was changed doesn't make sense. **Syschk** is offering to replace this value with the current time. This check is omitted by the Standalone version.

BLOCKS ARE MISSING rebuild free list? After all filesystem structures have been examined, some blocks remain unaccounted for. **Syschk** is offering to replace the free list with a good one.

CANNOT ACCESS BAD BLOCK I-NODE. The bad block file cannot be opened (one possibility is that the inode itself is in a bad block and cannot be read). The previous record of what blocks were bad is ignored.

CANNOT EXTEND DIRECTORY TO MAKE filename. The given filename cannot be put in the directory. Either the directory cannot be read reliably, or there are no free blocks available for allocation. A subsequent message offers an alternative.

changes were made to the filesystem. check again? **Syschk** has corrected some filesystem problems; the filesystem should be checked again. An **n** response to the question will avoid the check.

CONNECTION FAILED destroy orphan? Either the orphan file cannot be linked to, or you typed "n" in response to the "connect to lost+found" message. **Syschk** is offering to delete the file.

DIRECTORY MISALIGNED shrink? The size of the given directory is not a multiple of the size of a directory entry. **Syschk** is offering to discard the partial entry.

'.' ENTRY IS INCORRECT fix? The "." directory entry does not refer to this directory. **Syschk** is offering to replace the offending link with a correct one.

'..' ENTRY IS INCORRECT fix? The ".." directory entry does not refer to the parent of this directory. **Syschk** is offering to replace the offending link with a correct one.

FREE BLOCK POINTER OUT OF RANGE rebuild free list? The free list is corrupt. More precisely, one of the block pointers in the free list refers to something other than a data block. **Syschk** is offering to replace the free list with a good one.

FREELIST CONTAINS A BAD BLOCK rebuild free list? One of the blocks in the free list cannot be reliably read. **Syschk** is offering to replace the free list with a good one.

FREELIST DUPLICATES A BLOCK rebuild free list? The free list is corrupt. More precisely, one block is a member of the free list more than once, or is a member of the free list and some other structure, such as a file. **Syschk** is offering to replace the free list with a good one.

free list is ok. rebuild free list? **Syschk** is offering to replace the good free list with a sorted one. Although this action is not necessary to repair a filesystem, sorting the free list may improve performance slightly.

HAS NO '..' ENTRY make one? The given directory has no entry to refer to its parent directory. **Syschk** is offering to build one. (See the NOTE under "NO '.' ENTRY".)

HAS *count* BLOCKS OUT OF BOUNDS, *count* DUPLICATED BLOCKS consider removal? The given file contains blocks that are also members of other structures. **Syschk** is offering to remove the file (in terms of total number of block-allocation problems on the disk). If you type "y", **syschk** will eventually display the message:

```
If that inode is removed, total out-of bounds will be "count"  
total duplicates will be "count" remove it?
```

or:

```
If that inode is removed, no block allocation problems will  
remain here. remove it?
```

In either case, typing "y" will delete the file. A file should only be deleted if the deletion would reduce the number of block allocation problems on the disk. The initial "consider removal" message prints the current totals; the later "remove it" message prints the resulting totals.

has *count* fewer blocks than are required. The given file has "holes" in it—blocks that have never been written to. No action is taken. Because a file can legitimately have such holes, a warning is produced only if the **-w** switch was specified when **syschk** was invoked.

I-NODE AREA OVERFLOWS FILE SYSTEM. The superblock (block 1 on the disk device) indicates that the entire file system is consumed or overflowed by the inode area. This is a fatal error.

I-NUMBER *number* OUT OF RANGE remove entry? The given directory entry refers to a non-existent inode. **Syschk** is offering to remove the offending link.

INCORRECT LINK COUNT *record*=*count*, *actual*=*count* fix? The inode record of the number of directory entries referring to it is not correct. **Syschk** is offering to correct the inode's record.

IS AN ORPHAN connect to /lost+found? The given file, although allocated, has no directory entries referring to it. **Syschk** is offering to create a link to this file in the lost-and-found directory (the directory *lost+found* on the filesystem being repaired). The link created will have the form "*lnnn*" where *nnn* is the i-number of the orphan file.

filename IS NOT A BLOCK OR CHARACTER DEVICE check regardless? The filesystem that **syschk** was told to check is not a device. Probably the wrong name was typed when **syschk** was invoked. **Syschk** is offering to check the file anyway.

count NEW BAD BLOCKS add to bad block inode? There are blocks on the disk that have become bad since the last addition to the bad block inode. **Syschk** is offering to allocate the newly-found bad blocks to the bad block inode, preventing them from being used in the future.

NOTE

Since the i-list is a fixed array on the disk, bad blocks in the i-list cannot be deallocated from the array.

NO /lost+found DIRECTORY. A link cannot be made in the lost-and-found directory because there is no such directory on the filesystem. Manual intervention is required if you want to recover orphan files. Here is the procedure:

NO '.' ENTRY add one? The given directory has no entry to refer to itself. **Syschk** is offering to build one. NOTE: Some programs assume that the "." and ".." entries are the first two entries in each directory. A directory repaired in this way may no longer fit that assumption and may not be treated properly by such programs.

REFERS TO A BAD BLOCK zero pointer? The given file contains a bad block. **Syschk** is offering to change the file so that it refers to a block of 0's instead of the bad block.

ROOT I-NODE IS NOT A DIRECTORY. The inode dedicated to the root directory is allocated, but is something other than a directory. This is a fatal error.

ROOT I-NODE IS UNALLOCATED. The inode dedicated to the root directory is not allocated. This is a fatal error.

TOO FEW I-NODES (count). The superblock (block 1 on the disk device) indicates that there are fewer than two inodes on the file system. This is a fatal error.

TOO MANY BAD BLOCKS ignoring bad block 'block'. There are more bad blocks on the disk than **syschk** can record. The given bad block is not being recorded as bad. This message indicates a serious problem with the disk. Perhaps the disk is not ready for I/O or the disk controller is at fault.

TOO MANY I-NODES (count). The superblock (block 1 on the disk device) indicates that there are more inodes than can be represented in an i-number (more than 65535). This is a fatal error.

FILES

- lost+found* The directory into which orphan files are linked. Orphan files are allocated files that have no links to them. A *lost+found* directory should be created under the root directory of each filesystem.
- /etc/passwd* The password file.
- /etc/group* Used to convert user and group ID numbers to names.
- /etc/checklist* Contains a list of default filesystems to check.
- /tmp/sysc????* Temporary file used by the standard TNIX version of **syschk**. The Standalone version uses for its temporary file the last 1001 blocks of the disk on which the root filesystem ends.

SEE ALSO

For more information about Standalone operation, refer to Section 1 of this manual.

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.



MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

Date: February 1, 1985 Change Reference: C1/285

Product: 8560 Series: System Manager's Guide-V2.1 Manual Part No.: 070-5050-00

DESCRIPTION

Product Group 61

The 512K Memory Board is now standard on 8560 Multi-User Software Development Units. (Mod # MDP 937).

CHANGE INSTRUCTIONS

Throughout this manual, change all references to the 256K Memory Board as standard configuration for the 8560 MUSDU, to read 512K Memory Board as standard.