SCO® UNIX®
Operating System
Installation Guide

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SCO® UNIX®
Operating System
Installation Guide

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Chapter 1

Before you start

This guide explains how to install the SCO UNIX System V Release 3.2 Operating System Version 4.0 on your computer. It also explains how to update from your current software (if Release 3.2, Version 2.0) to the new release. **The "Update installation" can only be performed on a Release 3.2, Version 2.0 system.** If your current system is *not* Release 3.2, Version 2.0, then you must install this new release using the "Fresh installation" option, even if an older version is already installed. See the "Installation options" section in this chapter for more details.

Please read this guide thoroughly before beginning the installation procedure so you become familiar with the steps and terminology used in each section. If you experience difficulties during the installation, see Appendix I, "Troubleshooting," for more information. Information on the available technical services is obtainable from your software supplier.

This chapter contains information essential to the successful installation (and subsequent operation) of your system. It is important that you are fully aware of this information before proceeding any further with the installation.

About this guide

This guide consists of this introductory chapter and two chapters that describe the two separate installation procedures (Fresh and Update). In addition, the guide includes a number of appendixes. Some of these appendixes contain specialized configuration options that are applicable to only a few installations.

This chapter, *"Before you start,"* contains general information about the SCO UNIX System V distribution, what you need to install the software on your system, the installation options available, additional notes for the installation procedure, and conventions used in this guide.

Chapter 2, "Running the fresh installation," contains the procedure for installing the complete operating system using the Fresh installation option. See the section "Installation options" in this chapter for a fuller description of the Fresh installation option, and Appendix A, "Creating and formatting a physical DOS partition," for information concerning your DOS PARTITIONS. If you use the Fresh installation option, you do not need to read Chapter 3.

Chapter 3, "Running the update installation," contains the procedure for updating the existing operating system to the new software release using the Update installation option. See the section "Installation options" in this chapter for a fuller description of the Update installation option. If you use the Update installation option, you do not need to read Chapter 2.

The *"Installation checklist"* at the beginning of Chapters 2 and 3 explains the information that you are prompted for during the installation. To help the installation and configuration of your system, fill out the checklist for the procedure (Fresh or Update) *before* beginning the installation procedure.

Appendix A, "Creating and formatting a physical DOS partition," contains information for creating and formatting a physical DOS partition *before* installing the UNIX system. It also contains the information you need to do this if the UNIX system is already installed.

Appendix B, "Using boot-time loadable drivers," contains the procedure for linking third-party DEVICE DRIVERS into the kernel at BOOT-time. These are drivers on the boot-time loadable drivers (BTLD) disk, supplied by the third-party manufacturer, that you may need when installing your system.

Appendix C, "Running the configurable disk initialization," explains how to configure your HARD DISK manually using the Fully Configurable hard disk initialization option. Fully Configurable initialization allows you to set the hard disk parameters, specify the size of the UNIX partition, preserve any existing partitions, and control the layout of the FILESYSTEMS and swap area. If you do not need to manipulate the hard disk initialization, choose the Automatic hard disk initialization option. Read the "Hard disk initialization" section later in this chapter to find out if you need to manipulate your hard disk.

Appendix D, "Setting time zones outside North America," describes how to set your time zone if you are not located in North America. If you are located in North America, you do not need to read this appendix.

Appendix E, "Installing and removing additional software," describes how to add other applications, and how to add or remove extended operating system packages at a later date.

Appendix F, "Using your additional filesystems," explains how to prepare your additional filesystems for use. If no additional filesystems (such as /u) are created during the installation procedure, either manually or by system default, you do not need to follow these instructions.

Appendix G, "Creating an emergency boot floppy set," contains information for creating an emergency BOOT FLOPPY set immediately after installation. You can use these floppies to boot your system if it ever becomes so corrupted that it fails to boot from the hard disk.

Appendix H, "Backing up and restoring your system," describes the procedure for backing up all or part of your system. For the Update installation, you are strongly advised to back up the ROOT filesystem immediately before installing the software so that you can restore this filesystem if your update fails.

Appendix I, "Troubleshooting," contains tips on solving some of the common problems that you may have during, and immediately after, installation.

Appendix J, "Installation messages," contains messages that could appear on your screen during the installation procedure. This includes the cause of these messages and any actions that could be taken before seeking technical support.

The *"Glossary"* contains terms used in the installation procedure. If you find a computer term you are not familiar with, look in this section.

About your installation media

SCO UNIX System V Release 3.2, Version 4.0, is available on floppy disks, cartridge tape and compact disc (CD-ROM). These distributions are described below.

The floppy disk distribution includes the following:

- two floppy diskettes labeled N1 (Boot) and N2 (Root Filesystem)
- one floppy diskette labeled M1 (Master Installation Floppy)
- Base Utilities, a set of numbered B volume diskettes
- Extended Utilities, a set of numbered X volume diskettes

NOTE Refer to the chapter titled "Introduction" in your *Release Notes* for more information about the diskette distribution for this release of the software.

The cartridge tape distribution includes the following:

- two floppy diskettes labeled N1 (Boot) and N2 (Root Filesystem)
- one floppy diskette labeled M1 (Master Installation Floppy)
- one 1/4-inch QIC cartridge tape

The CD-ROM distribution includes the following:

- two floppy diskettes labeled N1 (Boot) and N2 (Root Filesystem)
- one floppy diskette labeled M1 (Master Installation Floppy)
- one CD-ROM disc

This guide provides instructions that are specific to the usage of each medium in the installation procedure. All three distributions require and use the N1, N2, and M1 floppy volumes for installation.

Installation requirements

To install SCO UNIX System V, you need the following:

- an appropriate amount of memory (RAM). Check your *Release Notes* to determine the amount of RAM needed with your system. The *Release Notes* also contain information on any additional hardware configuration requirements.

- the necessary disk space, on the hard disk, to install the software you choose. **For the "Fresh" installation,** consult your *Release Notes* for the disk space requirements associated with SCO UNIX System V. These requirements vary according to how much of the UNIX system you plan to install. A table in the *Release Notes* summarizes the amount of disk space required to install each package. If you install a subset of the distribution, add the sizes of the segments that you wish to install as instructed in the *Release Notes*.

For the "Update" installation, the process requires 10 Mbytes of disk space on the *root* filesystem plus an additional 1 Mbyte, approximately, for each boot-time loadable DRIVER (BTLD) disk to be used.

> **NOTE** For information on required memory and disk space, see the chapter titled "Before installing your software" in the *Release Notes* of this documentation set.

- one floppy disk drive
- **if you have a cartridge tape distribution,** a supported 1/4-inch cartridge tape drive.

- **if you have a CD-ROM distribution,** a supported CD-ROM drive.

  > **NOTE** For a list of supported cartridge tape and CD-ROM drives, see Appendix A, "Compatible hardware," of the *Release Notes*.

- the SCO UNIX System V distribution media (floppy diskettes and, if appropriate, one 1/4-inch QIC cartridge tape or CD-ROM)

- a serial number (an alphanumeric code printed on the Serialization Card)

- an activation key (an alphabetic code printed on the Serialization Card)

- the "Installation Checklist" that you complete at the beginning of the installation procedure chapter

What you need to know

Before you begin the installation procedure, make sure that your computer is fully assembled (and operational) and that you are familiar with its operation. In particular, you should know what kind of hardware you have installed in your computer (manufacturer names, model numbers, and the interrupt vector, DMA, I/O, and base address settings of each piece of hardware).

If you have just assembled your computer for the first time or are unsure about the items listed above, read the hardware manuals provided with your computer and hard disk. The hard disk must be connected to your computer according to manufacturer's specifications. In addition, we suggest that you run a system self-test as described in the operator's guide for your computer to detect any possible hardware problems before installing the UNIX system.

> **NOTE** If you intend to use DOS or OS/2 on your machine, it is recommended that you install DOS first on your hard disk. Refer to Appendix A, "Creating and formatting a physical DOS partition," in this guide and "Using MS-DOS and other DOS operating systems" in the *System Administrator's Guide* for details.

Installation options

SCO UNIX System V provides options for installation in two areas: the software installation and the hard disk initialization.

Software installation

The software provides two separate paths for installing the operating system, the "Fresh installation" and the "Update installation." Either path results in the installation (and subsequent operation) of SCO UNIX System V Release 3.2 Operating System Version 4.0. The path you select is dependent on your current operating system status and requirement. Both options are described here.

Fresh installation

The Fresh installation procedure is intended for first-time users of SCO UNIX System V and current users with versions prior to Release 3.2, Version 2.0 operating systems. Using this option, the system allows you to either overwrite the entire contents of your hard disk with the new software or retain segments important to your new configuration. To prevent other operating systems on the hard disk, such as DOS, from being overwritten, select the "Fully Configurable" option for initializing the hard disk. See the section, "Hard disk initialization," later in this chapter for more information on initializing your hard disk. Fill-in the "Installation Checklist" at the beginning of the Fresh installation procedure chapter accordingly. The procedure for using the Fresh installation option is described in Chapter 2.

Update installation

The Update installation procedure is intended solely for users with SCO UNIX System V Release 3.2 Operating System Version 2.0 already installed. This option updates the existing Version 2.0 operating system to Version 4.0. The update is performed "in-place" because the process retains all user and system data on the existing system. The installation retains this data by updating only the files on the SCO UNIX System V distribution and not recreating the existing *root* filesystem completely. This means that all the existing user-created files and directories on the *root* filesystem remain unchanged after the update.

The "in-place" update performs the following functions:

- updates from Version 2.0 to Version 4.0
- retains all user data
- retains all system data
- retains all existing SCO device drivers

The procedure for using the Update installation option is described in Chapter 3. This chapter also contains details for the retained user data.

Hard disk initialization

During the hard disk initialization procedure, which prepares your hard disk for loading the distribution, you can select either the "Automatic" or "Fully Configurable" option.

Automatic initialization

The "Automatic" disk initialization simplifies the hard disk initialization procedure for users with minimal experience with computers and UNIX operating systems. This option uses system default values for the installation. If you do not need a specialized system configuration, choose the "Automatic" disk initialization. It creates a single, active UNIX partition and divides it into a *root* filesystem, a swap area, and if the UNIX partition is 245 Mbytes or larger, a user (*/u*) filesystem. It also preserves your existing DOS partition on the hard disk.

Fully configurable initialization

The "Fully Configurable" initialization procedure is for systems with special requirements. Select the "Fully Configurable" disk initialization procedure if you wish to use any of the following features:

- "non-standard" hard disk; that is, a hard disk that is not supported by the ROM BIOS

- ability to specify size of UNIX system partition

- ability to preserve existing non-UNIX system partition

- ability to preserve existing filesystem(s) within the UNIX system partition

- special swap space allocation

To help further in deciding which option to select, see the the next section, "Planning your disk layout" for more details.

Planning your disk layout

If you anticipate a large number of users, heavy development usage, or you plan to use a database system, it is advisable to plan the layout of your hard disk carefully. Systems under heavy use require decisions that affect performance.

This planning section briefly describes two segments of your hard disk (*/u* filesystems and the swap area) in relation to the UNIX system *root* filesystem (the DOS partition is mentioned here because it affects available disk space).

The *Automatic initialization* option performs this disk layout using system default values based on the disk space available. However, if you intend to use your system heavily, select the *Fully Configurable initialization* option, which allows you to specify values other than the system defaults calculated for typical multiuser operation.

- swap space

    The swap space is a part of your disk that acts as an extension of your physical memory (RAM). Programs (or parts of programs) that are in active use but currently in a waiting state can be shifted to this area (swapped out) so that others can run in RAM. The swap space must be large if there are many users or large applications, such as databases. For more information on calculating your required swap space, see the section "Determining swap space allocation," in Appendix C, "Running the configurable disk initialization," of this guide.

- separate (mountable) user filesystems (*/u*)

    A large hard disk (140+ Mbytes capacity) with many users can be slowed down by a large *root* filesystem. Creating a separate (usually called */u*) filesystem for user accounts improves performance, makes BACKUPS easier, and helps protect the *root* filesystem from corruption during a system 'crash'. For more information on making your user filesystem, see the section "Creating a separate (/u) filesystem," in Appendix C, "Running the configurable disk initialization," of this guide.

- DOS partition

    It is essential to plan your disk resources carefully before installing DOS, because any subsequent changes in the disk layout require a complete reinstallation of the operating system. Users who wish to have DOS share the hard disk must consult the "Using MS-DOS and other DOS operating systems" chapter of the *System Administrator's Guide* and install DOS on their disk first.

    For additional information, see Appendix A, "Creating and formatting a physical DOS partition," and the "Determining swap space allocation" and "Creating a separate (/u) filesystem" sections in Appendix C in this guide to help plan your disk layout before installing DOS.

Installing on disks with greater than 1024 cylinders

If your primary (*root*) hard disk has more than 1024 CYLINDERS, the following restrictions apply:

- The disk controller must support disks with more than 1024 cylinders.

- If the disk is configured as the primary hard disk, the ROOT FILESYSTEM *must* lie within the first 1024 cylinders. This is because the ROM BIOS cannot access boot information if it lies beyond the 1024th cylinder.

  If the boot information lies beyond the 1024-cylinder boundary, the system may hang mysteriously or display error messages. For more information, see Appendix I, "Troubleshooting," in this guide.

The **divvy**(ADM) UTILITY controls the layout of your hard disk filesystems. If the DIVVY program detects that your *root* filesystem extends over the 1024 cylinder boundary, it shrinks your *root* filesystem size to just below this boundary. This shrinking is dependent on the size of the filesystem remaining. For more information, see Appendix C, "Running the configurable disk initialization," in this guide.

You can use the rest of the disk for SWAP SPACE and additional filesystems. If you install a UNIX partition only, verify that the *root* filesystem is located within the first 1024 cylinders.

Since this limitation is expressed in cylinders and UNIX system **fdisk**(ADM) uses tracks, you should determine the number of TRACKS per cylinder for your disk. To then determine the maximum allowable extent of the *root* filesystem in tracks, divide the total number of tracks by the total number of cylinders and multiply this number by 1024. For more details, see the section "Converting fdisk numbers" in Appendix A of this guide.

NOTE If you remapped the disk during formatting, the *root* filesystem must lie within the first 1024 logical cylinders.

Additional installation notes

Read the *Release Notes* and this *Installation Guide*, and make sure that you understand the installation process completely before you install SCO UNIX System V. Do not assume that you know what is about to happen, even if you have installed the system before. In addition, take note of the following points:

- If you need to stop the installation process for any reason, press the computer "reset" button or turn the power off and on and start the process again from the beginning rather than trying to proceed from the stopping point. When the boot prompt is displayed, enter **restart** to start the installation from the very beginning. This is specific to the "Fresh" installation.

- Do not abort the installation process by using the ⟨Del⟩ or ⟨Ctrl⟩\ keys, unless a message appears that explicitly tells you to abort in this way.

- SCO UNIX System V and MS-DOS must boot from the primary (physical) drive 0 (hard disk or diskette). Keep this in mind when planning for extra hardware.

Responding to prompts

Follow these rules when responding to prompts for information during the installation procedure.

Use the keyboard to enter information:

- Enter all requested names and numbers exactly as shown.

- Complete each line by pressing the ⟨Return⟩ key.

NOTE The ⟨Return⟩ key is sometimes denoted on the keyboard by a "down-left" arrow, or referred to as the ⟨Enter⟩ key.

Use the numeric keypad to enter numerals when specifically requested by the installation process. Press ⟨Num Lock⟩ to use your keypad.

If you make an error while entering information, erase the character using one of the following methods:

- Use the ⟨Bksp⟩ key.

- Press ⟨Ctrl⟩**h**.

- You can delete everything you have entered on a line by pressing ⟨Ctrl⟩**u**.

> **NOTE**   To use a control-key sequence, press the ⟨Ctrl⟩ key and the other key at the same time. This is the same type of action as using the ⟨Shift⟩ key.

In addition:

- The following two prompts are asking "yes or no?" and "yes, no, or quit?":

    `(y/n)?`

  (y/n/q)?

  Respond to these prompts by pressing the **y**, **n**, or **q** keys, and then pressing the ⟨Return⟩ key.

- System default options that can be accepted by pressing the ⟨Return⟩ key are displayed in square brackets, for example, [*default*].

- Prompts from the computer are shown in `courier` typeface.

- Commands referred to in text are shown in **boldface** typeface with the reference section next to the command in parentheses (for example, **cat**(C)).

- Filenames are shown in *italic* typeface.

- Glossary entries are shown in SMALLCAPS typeface.

If you intend to install a DOS partition, you must create it before installing SCO UNIX System V. If you do not, you might render your UNIX partition unbootable. Consult your MS-DOS installation documentation to create your DOS partition. See Appendix A, "Creating and formatting a physical DOS partition," of this guide for important information. "Using MS-DOS and other DOS operating systems" in the *System Administrator's Guide* explains how the UNIX partition and the MS-DOS partition share the hard disk. Remember that DOS **fdisk** reports disk size in cylinders, while UNIX FDISK reports disk size in tracks.

If you have any problems installing SCO UNIX System V, see Appendix I, "Troubleshooting," for information on solving common installation problems. Appendix J, "Installation messages," contains the messages that might appear on your screen during installation and helpful hints on what you could do next.

Installation checklist

Before you begin to install SCO UNIX System V, it is recommended that you use the checklist in this section to write down information that you need to respond to prompts during the installation procedure. This checklist can also be used for reference at a later date for installation and configuration information.

The following section lists each of the checklist items and where to find more information; use this information to fill out the checklist.

Boot-Time Loadable Drivers
> If you have a third-party product (that is, one which is not included in this release of SCO UNIX System V) which is required at installation-time and is a boot-time loadable package, for example, a boot-time loadable drivers (BTLD) disk containing your hard disk driver, then see Appendix B, "Using boot-time loadable drivers," for more details.

BTLDs are drivers that need to be loaded into the minimal KERNEL at boot-time. To help fill in the checklist section, refer also to your software supplier's documentation set for information on the BTLD packages.

Installation Option
> SCO UNIX System V provides two options for installing the software: Fresh and Update. The Fresh installation option cleanly installs the new release of the software on your system. This chapter covers the Fresh installation procedure.

The Update installation option installs the operating system by replacing the current system with the new release of the software. This update retains all user and system data already existing on your Release 3.2, Version 2.0 system. Proceed to chapter 3, "Running the update installation," and fill out the checklist there.

Hard Disk Initialization
> Automatic initialization creates a complete disk layout and configures your hard disk using system default values. Automatic initialization might take as long as one minute per MEGABYTE of space on the disk.

Fully Configurable initialization allows you to set the hard disk parameters, specify the size of the UNIX partition, and control the layout of filesystems and swap area. You can choose the default values at each selection. If you select Fully Configurable, fill out the checklist at the beginning of Appendix C, "Running the configurable disk initialization," before continuing the installation procedure.

Installation Device
> See Appendix A, "Compatible hardware," of the *Release Notes* for information on filling out the Installation Device checklist.

Security Level
> SCO UNIX System V includes enhanced security features, including more stringent password requirements, password aging schemes, and limits on user activities. The options include High, Improved, Traditional UNIX, and Low levels of security depending on your system requirements. For more information on levels of security, see the "Maintaining system security" chapter in your *System Administrator's Guide*.

Serial Number
> This is an alphanumeric code printed on the Serialization Card.

Activation Key
> This is an alphabetic code printed on the Serialization Card.

Fresh installation checklist

1. Boot-Time Loadable Drivers required?
☐ No
☐ Yes; enter package names:

_____

_____

_____

_____

2. Installation Option
☐ Fresh (continue with this chapter)
☐ Update (proceed to chapter 3)

3. Hard Disk Initialization
☐ Automatic
☐ Fully Configurable

4. Installation Device
☐ Floppy Disk Drive
☐ Cartridge Tape Drive
☐ CD-ROM Drive

If you have Cartridge Tape or CD-ROM Installation:

Device Drive Type _____

    SCSI and CD-ROM Drives

        Host Adapter: _____

        ID Number: _____

        LUN: _____

    All Other Drives

        Base Address: _____

        Interrupt Level: _____

        DMA Channel: _____

5. Select Security Level
☐ High
☐ Improved
☐ Traditional UNIX
☐ Low

6. Serial Number _____

7. Activation Key _____

Installing SCO UNIX System V

Once you complete the Installation Checklist, you are ready to start the actual installation process. Find the distribution disks labeled N1 (or "Boot" disk) and N2 (or "Filesystem" disk).

Follow these steps, remembering to press ⟨Return⟩ after you enter your responses on the keyboard.

1. Insert the N1 (Boot) floppy disk into the drive. If you have more than one floppy drive, use the primary drive (sometimes called the boot drive). Check your computer hardware manual if you are not sure which drive is the primary drive.

2. Turn on your computer.

    The computer loads the UNIX BOOTSTRAP program from the floppy disk and executes it. In the upper left corner of the screen, the computer might display the total amount of memory (RAM) installed.

3. Next, you see:

```
SCO UNIX System V/386

Boot
:
```

- **If third-party device drivers are not required,** press ⟨Return⟩ to boot from the floppy drive and continue with this step.

- **If you need to link in third-party device drivers using the BTLD facility,** enter **link** at the boot prompt and proceed to the section, "Boot-time loading in memory," of Appendix B, "Using boot-time loadable drivers." On completion, continue from step 4.

  NOTE If you need to restart the installation completely at any time, insert the N1 (Boot) floppy disk, and enter **restart** when the boot prompt is displayed. The installation starts from the very beginning.

  If you need to restart the installation and use the "link" string for BTLD as well, you must type **restart link=***pkg1* at the boot prompt. *pkg1* is the name of the package from which drivers are required.

If you pressed ⟨Return⟩, you see system messages similar to the following:

```
fd(64) unix root=fd(96) swap=ram(0) swplo=0 nswap=16 ronly mem=/p

Memory found: 0k - 640k, 1m - 9600k
```

After a moment, the system displays a series of messages with trailing dots:

```
Loading kernel fd(64)unix .text
.................................................
.................................................
.................................................
.................................................
Loading kernel fd(64)unix .data
.........................................
Loading kernel fd(64)unix .bss
```

These progress messages proceed as software is loaded.

4. You are then prompted to insert the next floppy disk:

```
Insert N2 (Filesystem) floppy and press ⟨Return⟩
```

Remove the N1 (Boot) floppy disk and insert the N2 (Filesystem) floppy disk and press ⟨Return⟩.

The operating system kernel is loaded into memory. The system then displays a copyright statement followed by system configuration information. This information appears similar to the following:

```
device    address         vector dma comment
------------------------------------------------------------------------
%serial   0x03F8-0x03FF   04    -    unit=0 type=Standard nports=1
%serial   0x02F8-0x02FF   03    -    unit=1 type=Standard nports=1
%floppy   0x03F2-0x03F7   06    2    unit=0 type=96ds15
%console  -               -     -    unit=ega type=0 12 screens=68k
%parallel 0x0378-0x037A   07    -    unit=0
%tape     0x0338-0x0339   05    1    type=wangtek
%disk     0x01F0-0x01F7   16    -    type=W0 unit=0 cyls=286 hds=16 secs=63
mem: total = 3712k, kernel = 1436k, user = 2276k
rootdev = 2/64, swapdev = 31/0, pipedev = <none>, dumpdev = 31/0
nswap = 16, swplo = 0, Hz = 100
kernel: i/o bufs = 468k
```

NOTE If you loaded any drivers from your BTLD disk, the system configuration information screen above will contain entries for these device drivers.

The system performs a self-check to determine if there are any problems with the hardware. Each stage generates a letter ranging from D-M. The letters appear rapidly in succession, overwriting each other as they are displayed.

If the letters stop displaying before the letter "M" is reached, see the "Installation kernel self-check letters" section in Appendix J, "Installation messages," for more information concerning the displayed letter.

Run hardware diagnostics as explained in your computer manual, correct any identified problems, and start the installation procedure again from the beginning. If the letters stop again, please contact your software supplier for more information and be prepared to report the last letter displayed.

The self-check using letters D-M occurs every time you boot up your SCO UNIX System V Operating System.

5. Once the system begins to run, you are prompted to select the type of installation you require: Fresh or Update. Both types are described in "Installation options" in Chapter 1 of this *Installation Guide*. First, the following screen is displayed:

```
Setting installation display environment ...
```

This is followed by:

```
          SCO System Software Installation

The Fresh installation option cleanly installs the new release of the
software on your system.

The Update installation option replaces the current release of the
software with the new release.

Installation Selection:

        1. Fresh installation
        2. Update installation
        3. Exit

Use the Numeric Keypad if present, using <Num Lock>
if necessary, to select one of the above options:
```

NOTE If the software installed currently on your system is *not* SCO UNIX System V Release 3.2 Operating System Version 2.0, you must use the Fresh installation option.

To use the Fresh installation, select option 1 and continue with this chapter. If you select option 2 to install the software using the Update installation, proceed to Chapter 3, "Running the update installation," of this guide for further instructions.

6. Then, the following menu is displayed:

```
Keyboard Selection

        1. American
        2. British
        3. French
        4. German
        5. Italian
        6. Spanish

Use the Numeric Keypad if present, using <Num Lock>
if necessary, to select one of the above options:
```

Select the number that corresponds to your keyboard.

7. Next, you see the prompt for hard disk initialization:

```
            System V Hard Disk Initialization

The primary hard disk in the system will now be initialized.

The initialization process can be either fully
configurable or automatic.

The fully configurable initialization requires you to
set the disk parameters, specify the size of the UNIX
partition, and control the layout of filesystems
and swap area.  System default values are available
at each selection.

The automatic disk initialization creates a complete
disk layout and configuration using system default
values.

Initialization Selection:

        1. Fully Configurable Initialization
        2. Automatic Initialization (use system defaults)
        3. Exit Installation

Select option:
```

- **For Fully Configurable initialization,** select option 1 and proceed to Appendix C, "Running the configurable disk initialization," and follow the procedure described there. When you finish initializing the hard disk, skip to step 9 of this procedure.

- **For Automatic initialization,** select option 2. This initializes your hard disk automatically, without prompts for disk parameters, filesystem sizes, and so forth. Automatic initialization might take as long as one minute per megabyte of space on the disk.

- **If you select option 3,** you exit the installation procedure and the system shuts down.

8. When you select the Automatic Initialization option, the screen clears and you see the following confirmation message:

```
Verify Automatic Disk Initialization

You have chosen to initialize the primary hard disk
automatically using system defaults.

The hard disk initialization will preserve any pre-existing
DOS partition, but will overwrite any non-DOS partitions.
A single, active UNIX partition will be created and divided
into a root filesystem, a swap area, and if the UNIX partition
is 245 megabytes or larger, a user (/u) filesystem.

Setting up the hard disk may take as long as one minute per
megabyte of space on the disk.

Are you sure you wish to do this? (y/n):
```

Enter **y** to continue with the Automatic Disk Initialization. If you select **n,** you return to the Hard Disk Initialization menu.

- **If you are installing on a SCSI disk,** ignore the messages on scanning the disk. All other disks are scanned.

- **If you are installing on an ST506 or ESDI disk,** the disk is scanned for flaws and those flaws are recorded in the BAD TRACK TABLE.

First, you see a line describing the hard disk you have installed. The message is similar to this example:

```
%disk  0x01F0-0x01F7  16  -  type=W0 unit=0 cyl=286 hds=16 secs=63
```

If you are initializing a SCSI disk, two lines are displayed. For example:

```
%disk    -        -        -       type=S   ha=0    id=0       lun=0
%Sdsk    -        -        -       cyls=80  hds=64  secs=32
```

Next, you see:

```
Creating UNIX partition...
```

You see the following:

```
Scanning disk...
Destructively scanning track x/y, n % of scan completed
```

This PROCESS takes approximately one minute per megaBYTE of disk space.

When the scan is complete, the following prompts are displayed:

```
Dividing UNIX partition into filesystem and swap divisions ...

Making filesystems

Setting up hard disk root filesystem ...

Extracting files ...
```

A few minutes elapse between each of these messages.

When the process is complete, you see:

```
Initialization of the hard disk is now complete.
```

NOTE If you want to add hard disks, finish the installation procedure first. At the end of this installation procedure, you are referred to the section that contains instructions for adding hard disks.

9. Next, you see:

```
                Product Medium Selection

SCO systems software provides three media for installing the product.

At this point, you can select the installation medium and configure the
driver parameters for the installation device.

Medium Selection:

        1. Floppy Diskette
        2. Cartridge Tape
        3. Compact Disc (CD-ROM)

Enter your choice or q to quit:
```

This enables you to specify your installation media.

- **Enter 1 for floppy installation,** and skip to step 14 to continue the installation.

- **Enter 2 for cartridge tape installation,** and skip to step 10 to continue the installation.

- **Enter 3 for compact disc (CD-ROM) installation,** and skip to step 11 to continue the installation.

- **If you select q to quit,** the installation is aborted. The system displays the following:

```
Installation aborted.

After the "Power Off or Reboot" prompt is displayed,
you may power down the system if required.
To resume the installation procedure from the aborted point,

        1. insert N1 (Boot) floppy in the drive,
        2. close the drive door, then press any key.

The screen will clear and display the "Boot :" prompt.
```

Pressing ⟨Return⟩ at the prompt resumes the installation from this point.

10. **For cartridge tape distribution,** you see:

```
The following tape drives are supported:
        scsi
        compaq
        wangtek
        everex
        archive
        mountain
        emerald
        tecmar
        btld
Enter your choice or q to quit [wangtek] :
```

> **NOTE** If you are installing SCO UNIX System V on a computer based on Micro Channel Architecture, instead of "emerald," you see "ibm6157" in the previous display and you will not see "compaq" in the list either.

Enter ⟨Return⟩ to select the default drive displayed in the square brackets. If the default provided is *not* the installation device for your UNIX system distribution, enter the name of your drive and press ⟨Return⟩.

If you plan to use a BTLD for the cartridge tape drive, enter **btld** and press ⟨Return⟩. See your third-party documentation for more information.

- **If you select "scsi"**, you see the following:

```
You must have your SCSI tape drive configured as:

        SCSI Target ID:        2
        SCSI Host Adapter:     0
        Logical Unit Number:   0

Confirm that your drive is configured for these values (y/n/q)
```

If your SCSI drive is correctly configured, enter **y** and proceed to step 14.

To return to the previous selection menu, enter **q** at the prompt.

If your drive is not correctly configured, (that is, your tape drive jumper settings are not configured as displayed on the screen), enter **n** at the prompt, wait until the REBOOT message occurs and switch off your machine, and set the correct jumper settings. Once the jumper settings are correct, turn on the machine again and continue the installation.

If the BTLD facility was used earlier, remember to type **link=*pkg1*** at the boot prompt again.

- **If you selected any drive other than "scsi" or "btld"**, you see a display similar to the following, which corresponds to the Wangtek:

```
Here are the default values for wangtek:

Base Address:     0x338
Interrupt Level: 5
DMA Channel:      1

Do you wish to use these values? (y/n/q)
```

If the defaults are correct for your drive, enter **y** and proceed to step 14.

If you need to modify any of the parameters, enter **n**.

You are prompted for new values for each of the parameters. After you modify the parameters, the screen shows your values. Enter **y** when the parameters are correct. The machine automatically reboots and the installation process continues.

To return to the previous selection menu, enter **q** at the prompt.

> **NOTE** If you change the tape parameters, write down the new values. You will need to specify the new tape parameters when you create an emergency boot floppy set later in this installation procedure.

11. **If you select CD-ROM**, you see the following:

```
Are you using a BTLD for CD-ROM? (y/n/q):
```

The CD-ROM drive can have either a system default driver or a third-party BTLD. Select your specified driver.

- Enter **n** to use the system default driver and proceed to step 12.

- Enter **y** to use the BTLD and proceed to step 13.

- Enter **q** to quit and return to the previous menu.

12. For the system default driver, you see:

```
You must have your CD-ROM drive configured as:

        SCSI Target ID:      5
        SCSI Host Adapter:   0
        Logical Unit Number: 0

Confirm that your drive is configured to these values (y/n/q)
```

If your SCSI drive is correctly configured, enter **y** and proceed to step 14.

To return to the previous selection menu, enter **q** at the prompt.

If your drive is not correctly configured, (that is, your CD-ROM drive jumper settings are not configured as displayed on the screen), enter **n** at the prompt, wait until the reboot message occurs and switch off your machine, and set the correct jumper settings. Once the jumper settings are correct, turn on the machine again and continue the installation.

If the BTLD facility was used earlier, remember to type **link=*pkg1*** at the boot prompt again.

13. For the BTLD, you see:

```
Is your CD-ROM drive configured for BTLD (y/n):
```

First, check that your drive has been correctly configured as specified by the BTLD documentation supplied by the software vendor. If a configuration conflict had occurred at the BTLD extraction point earlier, ensure that the new values used by the kernel are the same values for the drive.

If correctly configured, enter **y** and proceed to the next step.

If you need to change these values, enter **n**. The installation is aborted. Wait until the reboot message is displayed and switch off your machine, and set the correct jumper settings. Once the jumper settings are correct, turn on the machine again and continue the installation.

Also, remember to enter the **link=*pkg1*** string at the boot prompt from the hard disk.

14. Next, the system prompts you to insert the N1 (Boot) floppy again:

```
Insert N1 (Boot) floppy in the drive
and press <Return> or enter q to quit:
```

After you press ⟨Return⟩, the system displays:

```
Extracting files ...
```

If using BTLDs, the drivers will have to be extracted at this point and placed on the hard disk. Proceed to the section, "Loading drivers onto the hard disk", of Appendix B "Using boot-time loadable drivers" to continue your installation. On completion, return to step 15.

15. Next, you are prompted to insert the M1 (Master Installation) floppy:

```
Insert M1 (Master Installation) Floppy
and press <Return> or enter q to quit:
```

Remove the N1 (Boot) floppy and insert the M1 (Master) floppy. After you press ⟨Return⟩, the system displays:

```
Extracting files ...
```

16. **If you have a cartridge tape or CD-ROM installation**, you are prompted to insert the appropriate volume. For tape, you see the following:

```
Insert SCO System V Operating System Tape Volume 1
and press <Return> or enter q to quit:
```

Insert the tape (or CD-ROM) in the drive and press ⟨Return⟩. This is to install the RUNTIME SYSTEM.

> **NOTE** If you did not configure your drive properly, the system cannot access the tape. If this happens, enter **q** and press ⟨Return⟩ to shut down the system. You can then reconfigure the device, and power up the system to continue the installation from the aborted point. You are prompted for the volume again.

After you have inserted the tape, you see the following messages:

```
Rewinding tape ...

Installing custom data files ...
Creating file lists ...
Extracting SCO UNIX System V Runtime System Files ...
```

If you have the CD-ROM distribution, you are prompted similarly.

If you have the floppy disk distribution, you are prompted to insert the B1 volume, followed by the rest of the B volumes. At each prompt, insert the appropriate volume, and press ⟨Return⟩.

- If you insert a floppy disk in the wrong order, you see this error message:

```
Error:  Incorrect volume in drive
```

   Remove the floppy disk from the drive and insert the correct volume.

- If there is an error with the extraction procedure, you see this prompt:

```
Error: tar extraction error.
Do you wish to try extraction again? (y or n)
```

   Make sure that you are using the correct floppy disk and verify that the door of the floppy drive is completely closed, then enter **y.**

- If the extraction error message persists, see "Error reading a floppy" in Appendix I, "Troubleshooting," in this guide.

17. Now, you see the RESTRICTED RIGHTS LEGEND, followed by the product serialization prompt:

```
SCO UNIX System V Operating System Serialization

When prompted, use the serial number and activation key included
with the SCO UNIX System V Operating System distribution.

Enter your serial number or enter q to quit:
```

Enter the serial number exactly as it appears on your Serialization Card.

This is followed by:

```
Enter your activation key or enter q to quit:
```

Having entered the activation key exactly as it appears on your Serialization Card, you see the following message:

```
Checking file permissions ...
```

If you make a mistake in typing either the serialization number or activation key, you see:

```
Error: Invalid activation key

Do you wish to try again? (y/n)
```

Enter **y**. At the prompt, enter your code again. If the error continues, contact your supplier. Enter **n** to abort the installation.

18. At this point, you see some prompts requesting information about your location. First, you are prompted to set the appropriate time zone:

```
Time zone initialization

Are you in North America? (y/n)
```

If you are in North America, enter **y** and proceed to the next step. Otherwise, enter **n** and proceed to the instructions in Appendix D, "Setting time zones outside North America." When you have finished with Appendix D, return to step 21.

19. You see the following menu:

```
1. NST  - Newfoundland Standard Time
2. AST  - Atlantic Standard Time
3. EST  - Eastern Standard Time
4. CST  - Central Standard Time
5. MST  - Mountain Standard Time
6. PST  - Pacific Standard Time
7. YST  - Yukon Standard Time
8. HST  - Hawaiian-Aleutian Standard Time
9. SST  - Samoan Standard Time

Enter the number that represents your time zone or enter q to quit:
```

For example, if your time zone is Samoan Standard Time, select 9.

20. Now, you see the following:

```
Does daylight saving time (summer time) apply at your location? (y/n)
```

If daylight savings or standard time changes occur in your area, enter **y**. If not, enter **n**. You have now set the time zone variable in the */etc/TIMEZONE* file.

21. Next, the current system time and date are displayed. If this value is not correct, you can change it by entering the new time and/or date in the format shown here (for example, *yy* for year, *mm* for month and so on) or you can accept the displayed system default by pressing ⟨Return⟩ at the prompt:

```
Current System Time is Fri Aug 31 01:00:00 GMT 1991
Enter new time ([yymmdd]hhmm):
```

Having set the new system time, the screen displays the following message as the *terminfo* database is compiled:

```
Setting up terminfo database ...
```

The **terminfo**(M) database is now compiled. This takes a few moments.

22. **If you have a display adapter installed**, then ignore this step and proceed to the next step.

If no display adapter is installed in your computer, (the system assumes you are using a serial terminal as the console), you see the following prompt:

```
Please enter your terminal type as listed on the terminals(M)
manual page in your User's Reference.  For example, if you are
using a VT100 terminal, the proper terminal type is vt100.

Enter terminal type:
```

If you do not know the terminal type, refer to the manual page as directed. Hundreds of terminal types are supported, and many terminals have "emulation" modes that imitate popular terminals. Consult the user's manual for your terminal for setup instructions.

2

23. Next, the following messages are displayed, followed by a "Current Disk Usage" summary:

```
The minimum Run Time System for SCO UNIX System V is now installed.

You may choose to complete the installation at this point by
continuing to configure your system thus preserving the maximum
available disk space for user files or proceed to install any
additional software required before configuring the system for use.

The Extended Utilities software is installable in small packages.
This includes the Operating and Development System sets.  These
sets may either be partially installed by selecting individual
packages of the set or the set installed entirely.
```

24. You also see a menu that gives you the option of either installing required Extended Utilities packages or proceeding to configure the installed Runtime system:

```
1. Install additional software (Extended Utilities or applications)
2. Proceed with system configuration
```

So far you have installed the minimal, or Runtime system. If you are installing the operating system solely as a platform for an application, you may not need to install more software apart from the application software. However, should you need to administer the system extensively, have user accounts, and use the system administration shell, you need to install more software from the operating system packages before completing the installation.

- **If you want to install operating system packages or applications,** select option 1 and press ⟨Return⟩ to continue.

- **If you want to configure the installed Runtime system,** select option 2 and press ⟨Return⟩. Skip to step 37 to continue.

25. This stage involves "customizing" your system, adding only those parts of the operating system distribution that are useful to you. You can also install your applications. The installation program **custom**(ADM) is automatically invoked to install UNIX system packages and other products, including applications.

The main CUSTOM menu is displayed:
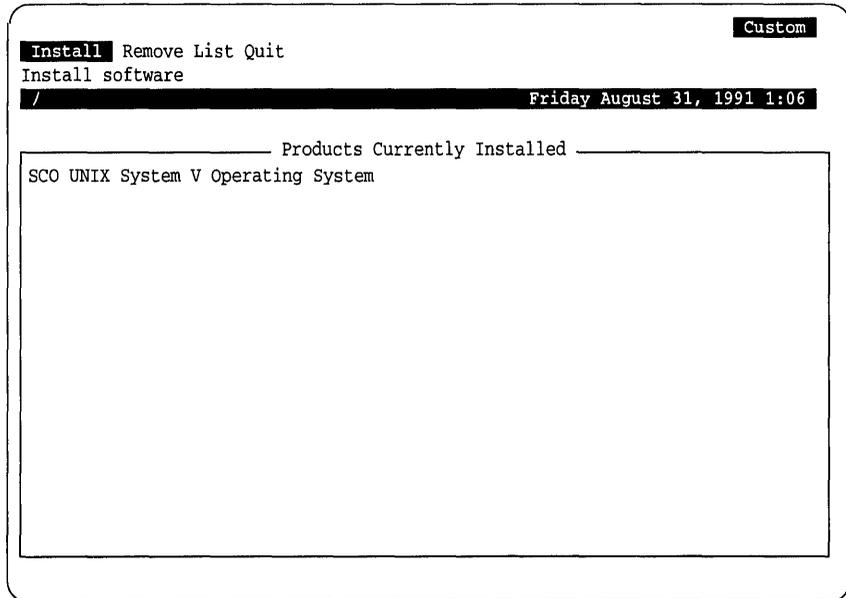
```
                                                              Custom
  Install  Remove List Quit
  Install software
  /                                      Friday August 31, 1991 1:06

  ─────────────── Products Currently Installed ───────────────
  SCO UNIX System V Operating System
```

The menu is already set to select Install, for installing software; press ⟨Return⟩ to continue.

26. Having pressed ⟨Return⟩, you see the next screen:

```
                                                              Install
Select a product to install and press <Return>
Press <Esc> to cancel, movement keys are active
/                                           Friday August 31, 1991 1:06

┌──────────────────────── Install ──────────────────────────┐
│                                                            │
│                                                            │
│                                                            │
│    Select a product   :     [                          ]   │
│                                                            │
│    Choose an option   :     [ Entire Product ]   Packages  Files │
│                                                            │
│                                                            │
│                                                            │
│                         ┌──────────────────────────────────┐
│                         │  A New Product                   │
└─────────────────────────│ *SCO UNIX System V Operating System │
                          └──────────────────────────────────┘
```
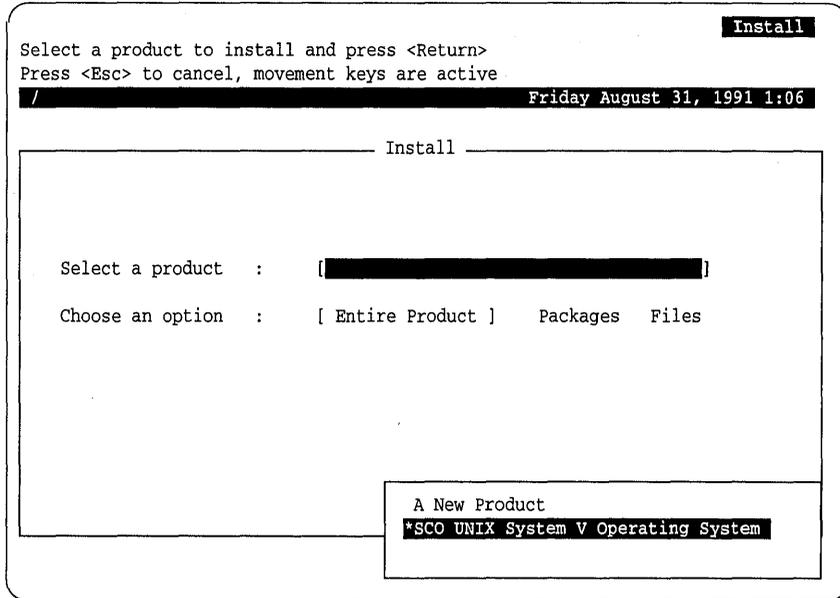
Use the ⟨Down Arrow⟩ key to highlight SCO UNIX System V Operating System as shown and press ⟨Return⟩.

27. Having selected to install the SCO UNIX System V Operating System, you see the following:

```
┌────────────────────────────────────────────────────────────────────┐
│                                                          ███Install███│
│  Install the complete distribution                                   │
│  ┌──────────────────────────────────────────────────────────────┐   │
│  │ /                                    Friday August 31, 1991 1:06│  │
│  └──────────────────────────────────────────────────────────────┘   │
│  ┌──────────────────────────────────────────────────────────────┐   │
│  │                                                              │   │
│  │                                                              │   │
│  │  Choose an option  :  ███Entire Product███  Services   Service Components │
│  │                                                              │   │
│  │                                                              │   │
│  │                                                              │   │
│  │                                                              │   │
│  │                                                              │   │
│  └──────────────────────────────────────────────────────────────┘   │
└────────────────────────────────────────────────────────────────────┘
```
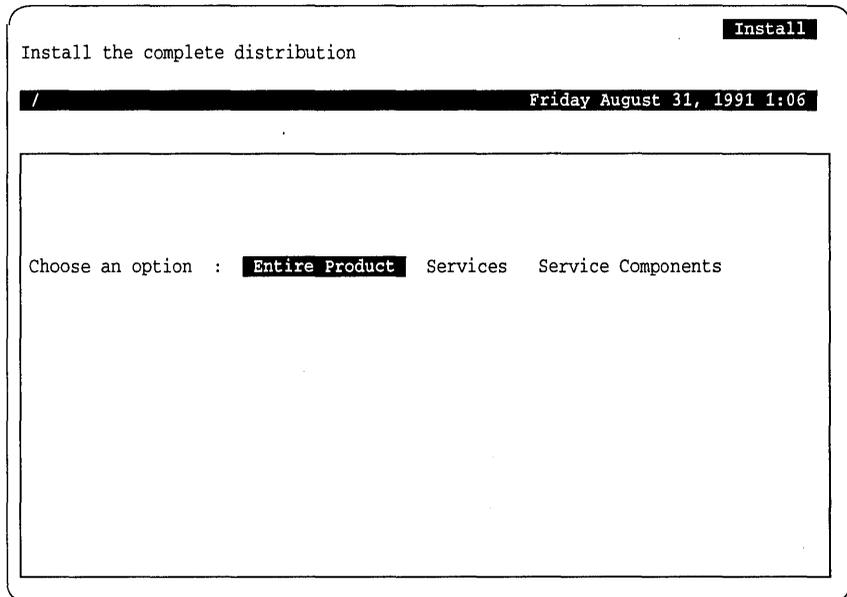
- **If you wish to install the entire distribution,** press ⟨Return⟩. Then proceed to step 28.

- **If you want to install only portions of the operating system,** use the ⟨Left Arrow⟩ key to highlight Service Components and press ⟨Return⟩. Then proceed to step 30.

28. Having selected to install the entire distribution, you see the following:

```
Creating file lists ...
```

This screen is followed by:
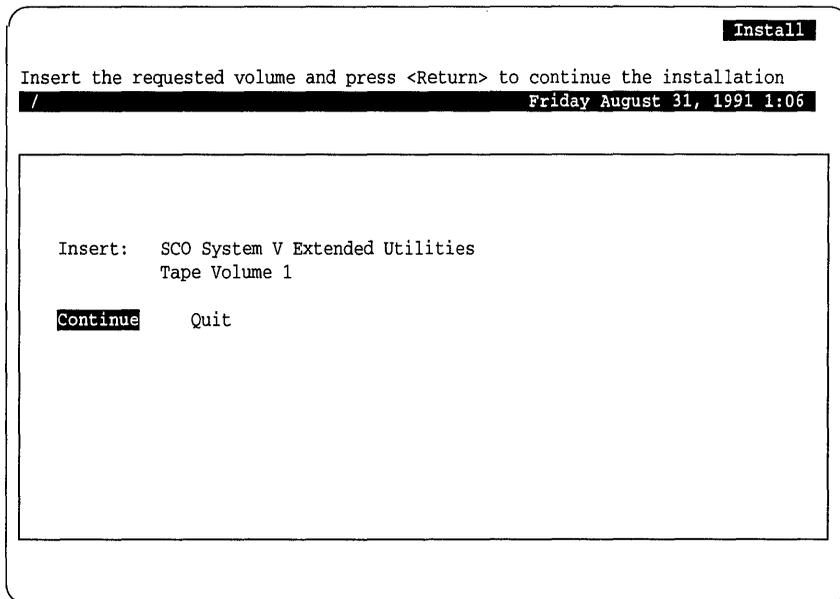
```
                                                               Install
Insert the requested volume and press <Return> to continue the installation
/                                              Friday August 31, 1991 1:06

    Insert:   SCO System V Extended Utilities
              Tape Volume 1
    Continue      Quit
```

Insert the tape volume as requested and press ⟨Return⟩.

- **For the floppy distribution,** you are prompted for Floppy Volume X1 plus other required volumes.

- **For CD-ROM distribution,** you are prompted for CD-ROM Volume 1. Insert the volume as requested.

29. Having inserted the appropriate volume and pressed ⟨Return⟩, the **custom** screen displays the following messages consecutively at the top of the menu:

```
Rewinding tape ...

Positioning tape ...

Extracting SCO UNIX System V Extended Utilities Files ...
```

All the packages are now extracted. This may take a few minutes. After this, proceed to step 34 to continue with the installation.

30. If you selected Service Components earlier (step 27) to install only portions of the operating system, you see the next screen:

```
                                                          Install
Select service component(s) to install and press <Return>
Press <Esc> to cancel, movement keys are active
/                                        Friday August 31, 1991 1:06


      Choose an option  :  Entire Product  Services  [ Service Components ]




                            ───── SCO System V Operating System ─────
                            SCO System V Runtime System
                            SCO System V Extended Utilities
```

Use the ⟨Down Arrow⟩ key to select SCO System V Extended Utilities and press ⟨Return⟩.

31. Having selected the extended utilities option, you see this screen:
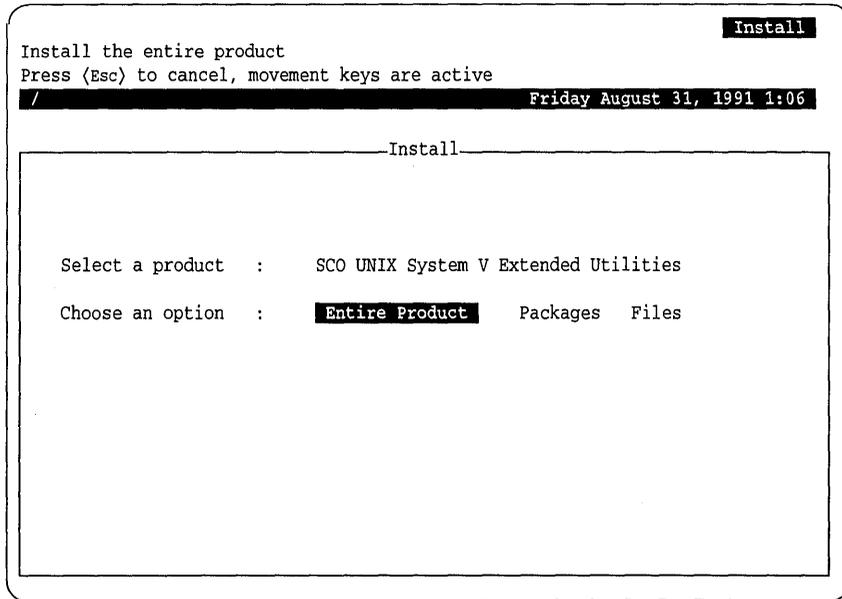
```
                                                      ┌─────────┐
                                                      │ Install │
                                                      └─────────┘
 Install the entire product
 Press ⟨Esc⟩ to cancel, movement keys are active
 ▐/▌▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬ Friday August 31, 1991 1:06 ▌

 ┌────────────────────────────────Install─────────────────────────┐
 │                                                                 │
 │                                                                 │
 │                                                                 │
 │    Select a product    :     SCO UNIX System V Extended Utilities│
 │                                                                 │
 │    Choose an option    :   ▐ Entire Product ▌   Packages   Files│
 │                                                                 │
 │                                                                 │
 │                                                                 │
 │                                                                 │
 │                                                                 │
 │                                                                 │
 └─────────────────────────────────────────────────────────────────┘
```

The Entire Product option is highlighted. Use the ⟨Right Arrow⟩ key to highlight Packages and press ⟨Return⟩.

32. Having selected the Packages option, you see the following:

```
                                                           ▌Install▐

Insert the requested volume and press ⟨Return⟩ to continue the installation
Press ⟨Esc⟩ to cancel, movement keys are active
 /                                           ▌Friday August 31, 1991 1:06▐



       Insert:   SCO UNIX System V Extended Utilities
                 Tape Volume 1

     ▌Continue▐    Quit
```

Insert the tape volume as requested and press ⟨Return⟩.

For the floppy distribution, you are prompted for Floppy Volume X1 plus other required volumes.

For CD-ROM distribution, you are prompted for CD-ROM Volume 1. Insert the volumes as requested.

custom(ADM) displays the following messages consecutively on the screen:

```
Rewinding tape ...

Positioning tape ...

Installing custom data files ...
```

33. Next, data files are loaded and you see the list of operating system packages similar to the following:

```
                                                            ┌─────────┐
                                                            │ Install │
                                                            └─────────┘
Select package(s) from which to choose files and press <Return>
Press <Esc> to cancel, movement keys are active
 /                                              Friday August 31, 1991 1:06


    Insert:     SCO UNIX System V Extended Utilities
                Tape Volume 1
    [Continue]      Quit
                              ── SCO System V Extended Utilities ──────
             Name      Inst    Size      Description
             *ALL      Part    33738     Entire Extended Utilities
             AIO       No      46        Asynchronous raw I/O administration
             BACKUP    No      272       System backup and recovery tools
             BASE      Part    1088      Basic extended utility set
             CSH       No      120       The C-Shell
             KSH       No      218       The K-Shell
             DOS       No      378       DOS utilities
             FILE      Part    318       File manipulation tools
             LAYERS    No      126       System V Layers
```

You can move up and down the list using the arrow keys. If you wish to select several packages to install, use the ⟨Space⟩ bar to mark each one with an asterisk (*). When you press ⟨Return⟩, each item you have marked is installed. Note that you can add all available packages by selecting ALL.

Refer to "Packages in this set" in your *Release Notes* for a list of operating system packages. The only software presently installed on your system is the RTS package, or Runtime system. This represents the minimal software needed to have a functioning operating system. Other packages can be added to suit your needs; if your system is merely a platform for applications such as spreadsheets, word processors, or databases, you should install the following packages:

SYSADM   a user-friendly interface for system administration
BACKUP   utilities to perform backups
LPR   the line printer spooler
MAIL   mail program for sending messages to other users

In addition, packages such as BASE, VI, and CSH are useful for users who wish to work in a traditional UNIX system environment, using the **ex**(C) or **vi**(C) file editors, various file utilities, and the C shell (**csh**(C)).

If your system requires the use of BTLDs for installation, then you must extract the Link Kit package at this point.

> **NOTE**   We recommend that you install the VI, FILE, BASE and LINK packages, as these contain useful utilities for maintaining your system. The VI package is recommended because it contains the **vi** editor, and the documentation uses this as an example editor when you are asked to edit default files. Some products (such as network software) have drivers that require linking into the kernel, so you should install the Link Kit (LINK).

If you have a large hard disk and space is not a problem, you can select ALL and install every package of the operating system.

34. If you install the MAIL or ALL package (or you selected Entire Product), you are eventually prompted for the following:

```
Executing SCO System V Operating System Init Script

Configuring the Link Kit to the devices found ...

Setting up printer terminfo database ...

Your system name is set to scosysv.
Do you wish the mail system to use a different name? (y/n)
```

The mail system *uses* the machine (system) name, so a requirement to use a different mail system name means changing the machine name from the system default name (*scosysv*) to a new name here.

If you respond **y**, you are prompted to enter the new name:

```
Input your machine's name, or enter q to quit:
```

The system confirms your choice with the following message:

```
The mail system will use name.UUCP as the
local machine name.  If you want to change this,
please edit the file /usr/mmdf/mmdftailor, and
any files in the directory /usr/mmdf/table that contain
the old name, and then run /usr/mmdf/table/dbmbuild.
Run "uname -S" to change the system name.
Press (Return) to continue
```

You should consult "Setting up electronic mail" in the *System Administrator's Guide* for more information about the system name and mail routing.

After pressing ⟨Return⟩, **custom**(ADM) displays the following:

```
Checking file permissions ...

Press any key to continue
```

Press any key to return to the **custom** Install menu.

35. You can install your applications using the option A New Product from the **custom** Install menu. You are prompted for various volumes (possibly including parts of your operating system distribution) just as you were for UNIX system packages.

36. When you have finished installing UNIX system packages and any products, exit **custom** by selecting Quit and entering **y** when you are asked to confirm your choice.

37. Next, you are prompted to specify the type of security for your system:

```
                    Trusted System Configuration

The system is designed to meet the requirements for the C2 level of trust
describing the protection given to prevent unauthorized access to a system
and its data. Levels 1 and 2 below are suitable for C2 systems.

You may reconfigure your system security to suit your own requirements.
Four levels of preconfigured security defaults are available:

        1.        High security - recommended for systems containing
                  confidential information and accessed by many users.

        2.        Improved security - recommended for systems accessed
                  by groups of users who may share information.

        3.        Traditional UNIX security - provided for compatibility
                  with other existing UNIX systems.

        4.        Low security - recommended only for systems not publicly
                  accessible and used by a small number of cooperating users.

Enter your choice:
```

For more information on Trusted security, see the chapters "Maintaining system security" and "Administering user accounts" in the *System Administrator's Guide*.

Having entered the required level of security, you see the following screen display:

```
Setting security mode ...
```

38. Next, you see the following screen:

```
The system software is now installed and the system configured for
a single user (root).

At this point, you may use the System Administration Shell
to add users, configure the system, or change system defaults.

        1. Run System Administration Shell
        2. Continue

Enter an option:
```

- Select option **1** to run **sysadmsh** to add users and filesystems and to configure the system.

- Select option **2** to perform system administration tasks after the installation procedure; proceed to step 42 to continue the installation.

A warning message is displayed:

```
NOTE:  Be sure to use the Quit option to exit the
System Administration Shell, so that the remainder
of the installation will be completed.

Press <Return> to continue
```

Press ⟨Return⟩. The system displays the main **sysadmsh** menu:

```
                                                     SysAdmSh

System Backups Accounts Printers Media Jobs Dirs/Files Filesystems Quit
Administer and configure system resources and report system status
/                                     Monday, November 26, 1991  13:47
```

The "sysadmsh: Using the system administration shell" chapter of the *System Administrator's Guide* explains how to use this interface in detail. Use the keystrokes in Table 2.1 to make selections from the **sysadmsh** menus:

Table 2-1   Basic menu keystrokes

Action	Keystroke
Move to menu option	arrow keys or ⟨Space⟩ (same as ⟨Right Arrow⟩)
Select menu option	first letter of option, or move highlight to option and press ⟨Return⟩
Return to previous menu	⟨Esc⟩
Get help	⟨F1⟩

You can familiarize yourself with the menu options by using the arrow keys or ⟨Space⟩ to move the highlight from option to option. Each time you move the highlight to a new option, a description of that option appears on the line below the menu options.

39. **If additional filesystems were created on your hard disk** (such as */u*) earlier in the installation, follow the instructions in Appendix F, "Using your additional filesystems," before proceeding. The instructions in this appendix explain how to prepare the additional filesystem(s) for use.

40. At this point, you can add user accounts to the system. The **sysadmsh** selection for creating a user account is:

    Accounts ⇨ User ⇨ Create

    Each person using the system should have a login account and password. The security of your system depends greatly on the restrictions you impose on the use of accounts. You can alter the defaults used to create accounts and administer them. For more information, see the "Administering user accounts" chapter of the *System Administrator's Guide*.

41. When you are finished, exit **sysadmsh** by selecting Quit from the top-level menu. Select Yes from the Quit menu. This allows you to continue with the installation procedure.

42. Now, you are prompted to assign the SUPER USER (*root*) password:

```
Please assign a password for the superuser account, "root".
Setting password for user:  root
Last successful password change for root: NEVER

        Choose password

You can choose whether you pick your own password,
or have the system create one for you.

        1. Pick your own password
        2. Pronounceable password will be generated for you

Enter choice (default is 1):
```

Press ⟨Return⟩ to pick your own password. Option 2 allows the system to create a password for you.

43. Next, you are prompted to enter the password, twice. The screen informa-
tion is similar to the display below. The exact content is dependent on the
level of security you selected for your system.

```
Please enter new password (at least 5 characters):
Please choose a password which contains a mixture of lower-
and upper-case letters, digits (0 - 9), and non-alphanumeric
characters (e.g., !, #, @, ;, %, or /.)

Please do NOT choose a password that is an English word,
or which is the name of a person, place, or thing, or which
contains the string "SCO", "XENIX", or "UNIX" (in either case).

New password:
Re-enter password:
```

The new password can be any combination of letters, numbers, and punc-
tuation marks, but it should be at least five characters long. Enter the new
password and press ⟨Return⟩. The system does not display the password
as you enter it, so type carefully. You are prompted to enter this password
twice, to verify that you have typed it correctly.

The following message is displayed:

```
Store the password in a safe place.  You will need it to login.

The password for "root" can be changed by logging in as "root"
and invoking the command 'passwd.'
```

The super user password is now in place. From now on, this password is
required whenever you attempt to access the system as super user. The
super user password keeps the system safe from unauthorized use.

DO NOT forget the super user password. To restore a forgotten super user
password, you have to contact your Support Services for assistance.

> **NOTE** Because it is very easy to make errors that could destroy files
> when logged in as the super user, log in as super user only to install pro-
> grams and to do system maintenance tasks. For a complete description
> of the super user, see the "Starting and stopping the system" chapter of
> the *System Administrator's Guide*.

If **BTLD was used,** the operating system is rebuilt. The BTLDs have to be
added to the LINK KIT before this build is done. Proceed to the section,
"Adding BTLDs to the Link Kit," of Appendix B "Using boot-time loadable
drivers" to continue your installation. On completion, return to step 44.

44. Next, you see the following messages:

```
The UNIX Operating System will now be rebuilt.
This will take a few minutes.  Please wait.

Root for this system build is /.
```

The configuration choices that you made during the installation are added to the system. As the system continues to rebuild, you see these messages:

```
Backing up /unix to /unix.old
Installing new /unix
Setting up new kernel environment
```

When the installation and configuration process is complete, the screen displays instructions on rebooting the system:

```
Installation and Configuration of the System V Operating System
is now complete.

After the "Power Off or Reboot" prompt is displayed,
reboot the system from the hard disk by removing the
floppy from the drive and pressing any key.

The screen will clear and display the "Boot:" prompt.
```

Then, the system displays the following message at the bottom of the screen:

```
**    Safe to Power Off    **
        -or-
** Press Any Key to Reboot **
```

Open the floppy door and press any key.

45. The screen clears and you see the following boot prompt:

```
SCO System V/386

Boot
:
```

Press ⟨Return⟩. This boots the system from the hard disk.

You see the following message:

```
hd(40)unix
```

This is followed by the messages with trailing dots, the system configuration screen, and some self-check diagnostics.

46. Then, you see the following prompt:

```
INIT: SINGLE USER MODE

Type CONTROL-d proceed with normal startup,
(or give the root password for system maintenance):
```

Press ⟨Ctrl⟩**d** to continue. If you enter the *root* password, the system goes to SYSTEM MAINTENANCE MODE (SINGLE-USER).

47. You are then prompted to set the system time. If the time that is displayed is incorrect, enter the current time. Otherwise, press ⟨Return⟩ to continue.

As the system starts up, you see copyright messages followed by messages from each of the services as servers are started.

48. Then, you see:

```
System is coming up.  Please wait ...
```

When the startup is completed, the screen displays the following message:

```
The system is ready.

Welcome to SCO UNIX System V

scosysv!login:
```

When the login prompt is displayed, the system is ready for users to log in. *scosysv* is the default machine name, unless the machine was renamed earlier in step 34.

49. If you plan to use electronic mail, you must create a password for the *mmdf* account. Log in as *root* and enter the following command:

    passwd mmdf

You are then prompted to create a password just as you did for the *root* account. You use this password when you need to administer the mail routing system. For more information on setting up MMDF, see the "Setting up electronic mail" chapter in the *System Administrator's Guide*.

50. At this point, you should create an emergency boot floppy set for your system. These disks allow you to recover your *root* filesystem quickly should it ever become corrupted to the point where you are unable to start the system from your hard disk. Follow the procedure in Appendix G, "Creating an emergency boot floppy set," in this guide.

Creating an emergency boot floppy set can save you hours that would otherwise be spent reinstalling your UNIX system completely. You should make regular backups of your filesystems so that, should any corruption occur, you have something from which to restore. See Appendix H, "Backing up and restoring your system," in this guide for more information on creating and restoring from backups.

51. If you want to add hard disks, follow the instructions in the "Adding hard disks" chapter of the *System Administrator's Guide*.

Chapter 3

Running the update installation

This chapter describes how to install your SCO UNIX System V Release 3.2 Operating System Version 4.0 software using the Update option.

This procedure updates your current version 2.0 operating system to the new version 4.0 system. It applies *only* if your current system is SCO UNIX System V Release 3.2 Operating System Version 2.0.

Updating involves the following:

- updating the current UNIX system *root* filesystem

This update affects only the *root* filesystem. Only files from the original distribution are replaced by the files from the new release of the software.

- retaining all user data

The update retains any user-specific data such as home directories, user-created files and directories, user IDs, group IDs, passwords, and mail boxes. Home directories residing in separate filesystems (such as /*u*) are also retained.

- retaining all system data

The process also retains core system data, which includes system configuration files, job scheduling files, filesystems, filesystem nodes, filesystem mount points, terminal control database, auditing parameters, file control database, system defaults and mail aliases.

- retaining all existing compatible SCO device drivers

All SCO device drivers on the existing system that are compatible with this new release remain configured in the updated system. These are the drivers shipped on the UNIX system distribution. Incompatible device drivers are removed and will need to be reinstalled in the updated system.

Please read through this chapter before updating the system.

About the update

To install your SCO UNIX System V Operating System using this Update option, you will be required to perform the following tasks:

- Check and repair the *root* filesystem using FSCK.

Use **fsck**(ADM) to check and repair the *root* filesystem before the update process starts. This ensures that the *root* filesystem to be updated is not corrupt. A corrupt filesystem causes the update to be aborted.

- Update the */etc/default/filesys* file with user filesystem information.

Use **sysadmsh**(ADM) to add filesystem information to the */etc/default/filesys* file before the update. This is to ensure that the updated system recognizes the filesystem names and nodes if they had not been created previously using **sysadmsh**(ADM). **divvy**(ADM) is used to check which filesystems to add. For more information on **divvy**(ADM), see the *System Administrator's Reference* in this documentation set.

- Back up the *root* filesystem using **sysadmsh**(ADM).

Use **sysadmsh**(ADM) to perform a backup of the *root* filesystem immediately before the update. This is to ensure that if the update is aborted from an irreversible point, the *root* filesystem for Release 3.2, Version 2.0, can be restored from the backup.

- Identify the hard disk space requirement for the Update.

To update your system successfully, the installation process requires 10 Mbytes of free disk space on the *root* filesystem to store files that will later be needed for the update.

For systems that require BTLD, the installation process needs sufficient disk space (on the *root* filesystem) to store the drivers extracted from the disk. The system requires approximately 1 Mbyte of disk space for each BTLD disk to be used.

The **df**(C) command can be used to find out the available disk space on the *root* filesystem. If more space is required on the *root* filesystem, non-critical user files (like the contents of */tmp*, */lost+found*, and log files) can be saved on media and restored after the update.

- Update modified system files.

The *root* filesystem contains files that might have been changed or modified for your pre-update system. These files are referred to as user-configurable system files (like */etc/termcap*), and they are processed in three ways:

- The Version 2.0 files that have not been modified are directly replaced by the Version 4.0 files.

− All new Version 4.0 files that can have user modifications merged in without adversely affecting the updated system are non-interactively updated during the update process.

− In cases where the non-interactive update is not possible because of the type of changes, the Version 2.0 files are not overwritten and the user has the opportunity to make these changes manually, if required. The updated system contains both versions (2.0 and 4.0) of the files. The system could either be used in this way or have the user modifications made after the installation. Here are the two cases of replaced and displaced files that occur in the update process.

  • Some of these files are directly replaced by the Version 4.0 files because the updated system requires the Version 4.0 files (like the contents of */etc/rc0.d*). The displaced Version 2.0 files are moved to a different location and any user modifications can be merged into the new files after the installation procedure, if required. Typically, these files could have been customized for specific third-party device drivers.

  • Most of the Version 2.0 user-configurable files are retained because they are specific to the current system setup and are required for a successful update (like */etc/termcap*). The Version 4.0 files are placed in a different location and the user modifications can be merged into these files after the installation procedure, if required.

These files are listed in the section, "Updating system files," of this chapter.

If you have local system modifications to the kernel, such as additional device drivers, these need to be "configured-out" during the update. To continue using these drivers after the installation, you simply need to reinstall them as you did before.

If you have SCO TCP/IP or SCO NFS installed, the update process may need to remove them.

If your system contains compatible versions of these additional packages, then the update process retains them on your new system. However, if they are incompatible with the updated system, the update removes them. If this is the case, it is recommended that you obtain the latest releases of these packages for your new system. See the chapter titled "Before installing your software" in the *Release Notes* in this documentation set for more information.

> **NOTE** This update leaves other operating systems intact. It does not affect other operating systems (or partitions), such as MS-DOS, that currently share the hard disk.

Installation checklist

Before you begin to install SCO UNIX System V, it is recommended that you use the checklist in this section to write down information that you need to respond to prompts during the installation procedure. This checklist can also be used for reference at a later date for installation and configuration information.

The following section lists each of the checklist items and tells you where to find more information about them; use this information to fill out the checklist.

Boot-Time Loadable Drivers
> If you have a third-party product (that is, one which is not included in this release of SCO UNIX System V) which is required at installation-time and is a boot-time loadable package, for example, a boot-time loadable drivers (BTLD) disk containing your hard disk driver, then see Appendix B, "Using boot-time loadable drivers," for more details.

BTLDs are drivers that need to be loaded into the minimal KERNEL at boot-time. To help fill in the checklist section, refer also to your software supplier's documentation set for information on the BTLD packages.

Installation Option
> SCO UNIX System V provides two options for installing the software: Fresh and Update. The Fresh installation option cleanly installs the new release of the software on your system. Proceed to Chapter 2, "Running the fresh installation," and fill out the checklist there. The Update installation option installs the operating system by replacing the current system with the new release of the software. The update retains all user and system data already existing on the system. This chapter covers the Update installation procedure.

Installation Device
> See Appendix A, "Compatible hardware," of the *Release Notes* for information on filling out the installation device checklist.

Security Level
> Select the level of security on the current system. To maintain the same security level on the updated system, you must select the pre-update level. After the update, if you wish to change this level, see the "Maintaining system security" chapter in your *System Administrator's Guide* for further information.

Serial Number
> This is an alphanumeric code printed on the Serialization Card.

Activation Key

This is an alphabetic code printed on the Serialization Card.

Update installation checklist

1. Boot-Time Loadable Drivers required?

☐ No

☐ Yes; enter package names:

_____

_____

_____

_____

2. Installation Option

☐ Fresh (proceed to chapter 2)

☐ Update (continue with this chapter)

3. Installation Device

☐ Floppy Disk Drive

☐ Cartridge Tape Drive

☐ CD-ROM Drive

If you have Cartridge Tape or CD-ROM Installation:

Device Drive Type _____

   SCSI and CD-ROM Drives

      Host Adapter: _____

      ID Number: _____

      LUN: _____

   All Other Drives

      Base Address: _____

      Interrupt Level: _____

      DMA Channel: _____

4. Select Security Level

☐ Trusted C2 Defaults

☐ Relaxed

5. Serial Number _____

6. Activation Key _____

3

Updating SCO UNIX System V

On completion of the Installation Checklist, the Update procedure can start.

Follow these steps, remembering to press 〈Return〉 after you enter your responses on the keyboard.

1. If the system is currently in multiuser mode, log in as *root* and enter the following command:

    /etc/shutdown

    Give the users five minutes to log off. When prompted, reboot the system and enter single-user mode. Remember to inform the users that the system will be "down" for a while.

2. To check and repair the *root* filesystem, type:

    fsck -b /dev/root

    For more information on **fsck**(ADM), see the *System Administrator's Reference* in this documentation set.

3. Update */etc/default/filesys* with filesystem information. Follow these steps:

    a. Identify the filesystems that have currently been added to the */etc/default/filesys* file by typing **pg /etc/default/filesys**. This file contains information that the update needs to recreate correctly the nodes and names of these filesystems. The filesystem information in this file has been generated by using **sysadmsh**(ADM) to add the filesystems to the system.

    b. If you do not know all the filesystems your system has, find the total number by using **divvy**(ADM).

For more information on **divvy**(ADM), see the *System Administrator's Reference* in this documentation set.

This check should be performed on each hard disk if your system contains more than one. If the system contains any filesystems that are not currently in the */etc/default/filesys* file, then add them to this file using **sysadmsh**(ADM).

    c. The filesystems must first be unmounted, if presently mounted, before the addition.

To find out which filesystems are already mounted, type **df -v**.

    d. If any of the filesystems that you wish to add to the *filesys* file are shown to be presently mounted from the **df -v** output, then type **umount /dev/***nodename*.

    e. To add these filesystems to the */etc/default/filesys* file, proceed to Appendix F, "Using your additional filesystems," and follow the steps there. On completion, proceed to the next step.

4. Back up the *root* filesystem.

The Backups ⇨ Create ⇨ Unscheduled selection of the **sysadmsh**(ADM) is the recommended method. See Appendix H, "Backing up and restoring your system," for more information.

5. Check for disk space on the *root* filesystem by typing:

     df -v /dev/root

For more information on **df**(C), see the *User's Reference* in this documentation set. If you require more space on the filesystem, save some of the non-critical files, remove these files from the system, and make sure you remember to restore   them   after   the   update.   The   requirement   is 10 Mbytes plus an additional 1 Mbyte per BTLD disk.

6. Type **/etc/haltsys** to halt the system.

7. Insert the N1 (Boot) floppy disk of the Version 4.0 distribution into the drive. If you have more than one floppy drive, use the primary drive (sometimes called the boot drive). Check your computer hardware manual if you are not sure which drive is the primary drive.

8. Type any key to boot the system.

   The computer loads the UNIX bootstrap program from the floppy disk and executes it. In the upper left corner of the screen, the computer might display the total amount of memory (RAM) installed.

9. Next, you see:

```
SCO UNIX System V/386

Boot
:
```

- **If third-party device drivers are not required**, press ⟨Return⟩ to boot from the floppy drive and continue with this step.

- **If you need to link third-party device drivers using the BTLD utility,** enter **link** at the boot prompt and proceed to the section, "Boot-time loading in memory," of Appendix B "Using boot-time loadable drivers." On completion, continue from step 10.

> **NOTE** If you need to restart the installation completely at any time, insert the N1 (Boot) floppy disk, and enter **restart** when the boot prompt is displayed. The installation starts from the very beginning. Only the update steps that had not previously been correctly performed are displayed again.
>
> If you need to restart the installation and use the link string for BTLD as well, you must type **restart link=*pkg1*** at the boot prompt. *pkg1* is the name of the package from which drivers are required.

As the system boots up, you see the following line:

```
fd(64)unix root=fd(96) swap=ram(0) swaplo=0 nswap=16 ronly mem=/p

Memory found: 0k - 640k, 1m - 9600k
```

After a moment, a series of prompts are displayed with trailing dots:

```
Loading kernel fd(64)unix .text
...............................................
...............................................
...............................................
...............................................
Loading kernel fd(64)unix .data
.........................................
Loading kernel fd(64)unix .bss
```

These progress messages proceed as software is loaded.

10. You are then prompted to insert the next floppy disk:

```
Insert N2 (Filesystem) floppy and press <Return>
```

Remove the N1 (Boot) floppy disk and insert the N2 (Filesystem) floppy disk of the Version 4.0 distribution and press ⟨Return⟩.

After the operating system kernel is loaded in memory, the system displays a copyright statement followed by system configuration information. This information appears similar to the following:

```
device     address          vector dma comment
------------------------------------------------------------------------
%serial    0x03F8-0x03FF  04     -   unit=0 type=Standard nports=1
%serial    0x02F8-0x02FF  03     -   unit=1 type=Standard nports=1
%floppy    0x03F2-0x03F7  06     2   unit=0 type=96ds15
%console   -              -      -   unit=ega type=0 12 screens=68k
%parallel  0x0378-0x037A  07     -   unit=0
%tape      0x0338-0x0339  05     1   type=wangtek
%disk      0x01F0-0x01F7  14     -   type=W0 unit=0 cyls=286 hds=16 secs=63
mem: total = 3712k, kernel = 1436k, user = 2276k
rootdev = 2/64, swapdev = 31/0, pipedev = <none>, dumpdev = 31/0
nswap = 16, swplo = 0, Hz = 100
kernel: i/o bufs = 468k
```

NOTE If you loaded any drivers from your BTLD disk, the system configuration information screen above contains entries for these device drivers.

The system performs a self-check to determine if there are any problems detected with the hardware. Each stage generates a letter from D-M. The letters appear rapidly in succession, overwriting each other as they are displayed.

If the letters stop displaying before the letter "M" is reached, see the "Installation kernel self-check letters" section in Appendix J, "Installation messages," for more information on the displayed letter. Run the hardware diagnostics as explained in your computer manual, correct any identified problems, and start the installation procedure again from the beginning. If the letters stop again, please contact your software supplier for more information and be prepared to report the last letter displayed.

The self-check using letters D-M occurs every time you bring up your UNIX system.

11. Once the system begins to run, you are prompted to select the type of installation: Fresh or Update. Both types are described in detail in "Installation options" in Chapter 1 of this *Installation Guide*. First, the following menu is displayed:

```
Setting installation display environment ...
```

This is followed by:

```
                  SCO System Software Installation

The Fresh installation option cleanly installs the new release of the
software on your system.

The Update installation option replaces the current release of the
software with the new release.

Installation Selection:

        1. Fresh installation
        2. Update installation
        3. Exit

Use the Numeric Keypad if present, using <Num Lock>
if necessary, to select one of the above options:
```

NOTE If the software installed currently on your system is *not* SCO
UNIX System V Release 3.2 Operating System Version 2.0, you must use
the Fresh installation option.

To use the Update Installation, select option **2** and continue with this
chapter. If you select option **1** to install the software using the Fresh
Installation, go to Chapter 2, "Running the fresh installation," of this guide
for further instructions.

Next, a line describing the hard disk installed is displayed. The message is
similar to this example:

```
%disk  0x01F0-0x01F7  16  -  type=W0 unit=0 cyl=286 hds=16 secs=63
```

If your system contains a SCSI disk, two lines are displayed. For example:

```
%disk    -        -        -        type=S   ha=0      id=0      lun=0
%Sdsk    -        -        -        cyls=80  hds=64    secs=32
```

12. For the Update installation to be successful, your new product must be the
    same as the current system installed on your machine (that is, SCO UNIX
    System V). The software displays the current system found and requests
    that you confirm that the new product to be used for the update matches
    your current system.

```
Your current system is SCO UNIX System V/386.

Verify that your new product is SCO UNIX System V/386
and enter 'c' to continue or 'q' to quit (c/q):
```

Check your M1 (Master) installation floppy or *Release Notes* and confirm that your distribution is for SCO UNIX System V. If your current distribution is SCO UNIX System V with SCO MPX Multiprocessor Extension, then the message displayed includes a warning to inform you that the updated version of SCO MPX will have to be re-installed after the update.

NOTE Open Desktop cannot be updated with this Version 4.0 distribution. To update your system, obtain the relevant Open Desktop update product.

- **If the distribution does not match the system found,** enter **q** to quit and abort the update.

- **If the distribution matches the system found,** enter **c** and continue with the update.

Then the system displays a series of installation messages:

```
Checking current root filesystem ...

Saving files for update ...
Extracting files ...
```

13. Next, you see:

```
              Product Medium Selection

SCO systems software provides three media for installing the product.

At this point, you can select the installation medium and configure the
driver parameters for the installation device.

Medium Selection:

        1. Floppy Diskette
        2. Cartridge Tape
        3. Compact Disc (CD-ROM)

Enter your choice or q to quit:
```

This enables you to specify your installation media.

- **Enter 1 for floppy installation,** and skip to step 18 to continue the installation.

- **Enter 2 for cartridge tape installation,** and proceed to the next step to continue the installation.

- **Enter 3 for compact disc (CD-ROM) installation,** and skip to step 15 to continue the installation.

- **If you select q to quit,** the update is aborted and the previous system is restored. The system displays the following:

```
Restoring previous system ...
Restoration complete.

Update aborted.

After the "Power Off or Reboot" prompt is displayed,
return to the presently installed system by removing the
floppy from the drive and pressing any key.

The screen will clear and display the "Boot :" prompt.
```

Pressing ⟨Return⟩ at this prompt reboots your version 2.0 system from the hard disk.

14. **For cartridge tape distribution,** you see:

```
The following tape drives are supported:
        scsi
        compaq
        wangtek
        everex
        archive
        mountain
        emerald
        tecmar
        btld
Enter your choice or q to quit [wangtek] :
```

> **NOTE** If you are installing SCO UNIX System V on a computer based on Micro Channel Architecture, instead of "emerald", you see "ibm6157" in the previous display and you will not see "compaq" in the list either.

Enter ⟨Return⟩ to select the default drive displayed in the square brackets. If the default provided is *not* the installation device for your UNIX system distribution, enter the name of your drive and press ⟨Return⟩.

If you plan to use a BTLD for the cartridge tape drive, then enter **btld** and press ⟨Return⟩. See your third-party documentation for more information.

- **If you select "scsi",** you see the following:

```
You must have your SCSI tape drive configured as:

        SCSI Target ID:        2
        SCSI Host Adapter:     0
        Logical Unit Number:   0

Confirm that your drive is configured to these values (y/n/q)
```

If correctly configured, enter **y** and proceed to step 18.

To return to a previous menu selection, enter **q** at the prompt.

If your drive is not correctly configured, (that is, your tape drive jumper settings are not configured as displayed on the screen), enter **n** at the prompt, wait until the reboot message occurs and switch off your machine, and set the correct jumper settings. Once the jumper settings are correct, turn on the machine again and continue the installation.

If the BTLD utility was used earlier, remember to type **link=***pkg1* at the boot prompt again.

- **If you selected any drive other than "scsi" or "btld",** you see a display similar to the following, which corresponds to the Wangtek:

```
Here are the default values for wangtek:

Base Address:     0x338
Interrupt Level:  5
DMA Channel:      1

Do you wish to use these values? (y/n/q)
```

If the defaults are correct for your drive, enter **y** and proceed to step 18.

If you need to modify any of the parameters, enter **n.** You are prompted for new values for each of the parameters. After you modify the parameters, the screen shows your values as above. Enter **y** when the parameters are correct. The machine automatically reboots and the installation continues.

To return to the previous selection menu, enter **q** at the prompt.

> **NOTE** If you change the tape parameters, write down the new values. You need to specify the new tape parameters when you create an emergency boot floppy set later in this installation procedure.

15. **If you select CD-ROM,** you see the following:

```
Are you using BTLD for CD-ROM? (y/n/q):
```

The CD-ROM drive can have either a system default driver or a third-party BTLD. Select your specified driver.

- Enter **n** to use the system default driver and proceed to the next step.
- Enter **y** to use the BTLD and proceed to step 17.
- Enter **q** to quit and return to the previous menu.

16. For the system default driver, you see:

```
You must have your CD-ROM drive configured as:

        SCSI Target ID:       5
        SCSI Host Adapter:    0
        Logical Unit Number:  0

Do you wish to use these values? (y/n/q)
```

If correctly configured, enter **y** and proceed to step 18.

To return to previous selection menu, enter **q** at the prompt.

If your drive is not correctly configured, (that is, your CD-ROM drive jumper settings are not configured as displayed on the screen), enter **n** at the prompt, wait until the reboot message occurs and switch off your machine, and set the correct jumper settings. Once the jumper settings are correct, turn on the machine again and continue the installation.

If the BTLD utility was used earlier, remember to type **link=*pkg1*** at the boot prompt again.

17. For the BTL Driver, you see:

```
Is your CD-ROM drive configured for BTLD? (y/n):
```

First, check that your drive has been correctly configured as specified by the BTLD documentation supplied by the software vendor. If a configuration conflict had occurred at the BTLD extraction point earlier, ensure that the new values used by the kernel are the same values for the drive.

If correctly configured, enter **y** and proceed to the next step.

If you need to change these values, enter **n**. The installation is aborted. Wait until the reboot message is displayed and switch your machine off, and set the correct jumper settings. Once the jumper settings are correct, turn the machine on again and continue the installation.

Also, remember to enter the **link=*pkg1*** string at the boot prompt.

18. Next, the system prompts you to insert the N1 (Boot) floppy again:

```
Insert N1 (Boot) floppy in the drive
and press <Return> or enter q to quit:
```

After you press ⟨Return⟩, the system displays:

```
Saving files for update ...
Extracting files ...
```

If using BTLDs, the drivers will have to be extracted at this point and placed on the hard disk. Proceed to the section, "Loading drivers onto the hard disk", of Appendix B "Using boot-time loadable drivers" to continue your installation. On completion, return to step 19.

19. Next, you are prompted to insert the M1 (Master Installation) floppy:

```
Insert M1 (Master Installation) Floppy
and press <Return> or enter q to quit:
```

NOTE **If you enter q to quit**, the update is aborted and the previous system is restored.

Remove the N1 (Boot) floppy and insert the M1 floppy. After you press ⟨Return⟩, the system displays:

```
Saving files for update ...
Extracting files ...
```

The M1 (Master) installation floppy contains information which can be used to perform a final check on your software distribution.

• **If your new distribution is SCO UNIX System V** as displayed previously by the system in step 12, the Update installation continues to the next step.

• **If the installation process detects that your new distribution is not SCO UNIX System V**, the current system is restored and the update aborted. First, you see the following:

```
Error: Product mismatch exists!
       Your previous system, SCO Open Desktop, cannot
       be updated by the new product, SCO UNIX System V/386.

The previous system will now be restored.
```

This is followed by:

```
Restoring previous system ...
Restoration complete.

Update aborted.

After the "Power Off or Reboot" prompt is displayed,
return to the presently installed system by removing the
floppy from the drive and pressing any key.

The screen will clear and display the "Boot :" prompt.
```

As instructed, wait for the "Power Off" prompt, remove the floppy from the drive, and press any key. When the "boot:" prompt is displayed, press ⟨Return⟩ to reboot your version 2.0 system from the hard disk.

Having extracted the M1 (Master Installation) floppy disk files, the system provides the choice to either update only the currently installed packages or to update these packages and the additional packages new to this Version 4.0:

```
                   Package Installation Choice

Select option 1 to update the packages that are currently installed.
If you select this option, you will still be able, at a later date,
to install packages new to this release. Please refer to the release
notes for the list of packages new to this release.

Select option 2 to update currently installed packages, and to install
packages new to this release.  This option will not install packages
that were included with the previous release, but which are not
currently installed on the system.

Package choice

        1. Update packages currently installed on the system.
        2. Update packages currently installed and install new packages.

Enter your choice or 'q' to quit :
```

As instructed, enter your choice and press ⟨Return⟩.

Next, the following message is displayed on the screen:

```
Recording currently installed packages ...
```

20. Next, the system checks for installed incompatible device drivers. The system regards all drivers *not* shipped with your SCO UNIX System V distribution as incompatible device drivers.

For SCO TCP/IP and SCO NFS, the system identifies the version numbers of these products, and if compatible with this release of SCO UNIX System V (version 4.0), the products are retained by the update process. Incompatible versions of these products will be removed by the update process. Refer to the chapter titled "Before installing your software" of your *Release Notes* for more information on which versions of SCO TCP/IP and SCO NFS are compatible with this release of SCO UNIX System V.

Firstly, *compatible services* are checked for as follows:

```
Checking for update compatible services ...
```

- If, for example, the installed versions of SCO TCP/IP and SCO NFS are found to be compatible with this Version 4.0, you see the following messages displayed:

```
Saving SCO TCP/IP Runtime System services ...

Saving SCO NFS Runtime System services ...
```

Secondly, *incompatible device drivers* are checked for:

```
Checking for update incompatible device drivers ...
```

- **If your system does not contain any incompatible device drivers**, the following is displayed:

```
No incompatible device drivers found.

WARNING: After this point, you will not be able
         to return to your previous system.
```

- **If your system contains incompatible device drivers,** you see a screen display similar to the following:

```
The following third-party device drivers are incompatible:

dipex   dipner's unknown driver
manix   description not found
kolax   description of kolax

WARNING: These device drivers need to be removed.
         When this is done, you will not be able to return
         to your previous system.
```

> **NOTE** In the previous examples, the system cannot locate the description of the *manix* driver package and *dipex* (written by *dipner*) is unknown to the system.
>
> To add these device drivers after the update, you must install them as was done previously.
>
> The incompatible device drivers found will be non-interactively removed by the update process at this point.

21. Then, you see the following prompt:

```
Do you wish to continue? (y/n)
```

- Enter **y** to continue with the update and proceed to the next step.
- **If you enter n to return to your previous system,** you see the following messages:

```
Restoring previous system ...
Restoration complete.

Update aborted.

After the "Power Off or Reboot" prompt is displayed,
return to the presently installed system by removing the
floppy from the drive and pressing any key.

The screen will clear and display the "Boot :" prompt.
```

As instructed, wait for the "Power Off" prompt, remove the floppy from the drive, and press any key. When the "boot:" prompt is displayed, press ⟨Return⟩ to reboot your Version 2.0 system from the hard disk.

> **NOTE** If you have to return to your previous system after this point, you need to abort the update process and restore your previous *root* file-system from the backup performed at the beginning of the update. Instructions for returning to your Release 3.2, Version 2.0, system are detailed in the "Aborting the update" section later in this chapter. For more information on restoring your *root* filesystem, see Appendix H, "Backing up and restoring your system," in this guide.
>
> If you stop the installation beyond this point, you have to either restore your previous system as detailed earlier or resume the installation at a later time to have a functional operating system. If the installation is resumed, the process will continue from the termination point.

22. Next, the system records information on the hard disk(s) installed. The screen displays a line similar to the one here for each non-primary hard disk. Disk information will be displayed *only* if you have more than one hard disk installed.

```
Recording hard disk information ...

%disk      -       -       -          type=W0 unit=1 cyl=989 hds=5 secs=26

Saving files for update ...
```

23. **If you have the cartridge tape or CD-ROM installation**, you are prompted to insert the appropriate volume. For tape, you see the following:

```
Insert SCO UNIX System V Operating System Tape Volume 1
and press <Return> or enter q to quit:
```

Insert the tape (or CD-ROM) in the drive and press ⟨Return⟩. This installs the Runtime system.

> **NOTE** If you did not configure your SCSI drive properly, the system cannot access the tape. If this happens, enter **q** and press ⟨Return⟩ to shut down the system. You can then reconfigure the device and restart the system. You are prompted for the tape volume again.

Then, you see the following messages:

```
Rewinding tape ...

Installing custom data files ...
Creating file lists ...
Extracting SCO UNIX System V Runtime System Files ...
```

If you have the CD-ROM distribution, you are prompted similarly.

If you have the floppy disk distribution, you are prompted to insert the B1 volume, followed by the rest of the B and N volumes. At each prompt, insert the appropriate volume, and press ⟨Return⟩.

• If you insert a floppy disk in the wrong order, you see this error message:

```
Error:  Incorrect volume in drive
```

Remove the floppy disk from the drive and insert the correct volume.

• If there is an error with the extraction procedure, you see this prompt:

```
Error: tar extraction error.
Do you wish to try extraction again? (y or n)
```

Make sure that you are using the correct floppy disk and verify that the door of the floppy drive is completely closed, then enter **y**.

• If the extraction error message persists, see "Error reading a floppy" in Appendix I, "Troubleshooting," in this guide.

24. Now, you see the RESTRICTED RIGHTS LEGEND, followed by the product serialization prompt:

```
SCO UNIX System V/386 Operating System Serialization

When prompted, use the serial number and activation key included
with the SCO UNIX System V/386 Operating System distribution.

Enter your serial number or enter q to quit:
```

Enter the serial number exactly as it appears on your Serialization Card.

This is followed by:

```
Enter your activation key or enter q to quit:
```

Enter the activation key exactly as it appears on your Serialization Card.

If you make a mistake in typing either the serialization number or activation key, you see:

```
Error: Invalid activation key

Do you wish to try again? (y/n)
```

Enter **y**. At the prompt, enter your code again. If the error continues, contact your supplier. Enter **n** to abort the installation.

Next, you see the screen display the following message:

```
Checking file permissions ...
```

25. Next, the current system time and date are displayed. If this value is not correct, you can change it by entering the new time and/or date in the format shown here (for example, *yy* for year, *mm* for month and so on) or you can accept the displayed system default by pressing ⟨Return⟩ at the prompt:

```
Current System Time is Sat Aug 31 01:00:00 GMT 1991
Enter new time ([yymmdd]hhmm):
```

Having set the new system time, the screen displays the following message as the *terminfo* database is compiled. The database is not compiled and the message not displayed if no modifications were made to the *terminfo* database on the previous system.

```
Setting up terminfo database ...
```

The **terminfo**(M) database is now compiled. This takes a few moments.

Next, you see the following messages displayed:

```
Restoring saved files ...

The recorded packages will now be updated ...
```

26. **If you have the cartridge tape or CD-ROM installation,** you are prompted
    to insert the distribution volume. For tape, you see:

```
Insert SCO UNIX System V/386 Operating System Tape Volume 1
and press <Return> or enter q to quit:
```

Insert the tape (or CD-ROM) in the drive and press ⟨Return⟩. This is to
install the packages from the Extended Utilities. **Only** the packages
installed on the previous system are extracted (plus the Link Kit, if BTLD
was used earlier).

If a BTL Driver was linked into the kernel earlier, the Link Kit package is
non-interactively extracted from the distribution at this point (if the previ-
ous system had the Link Kit package already installed, then it would be
retained by the update).

Next, you see the following messages:

```
Rewinding tape ...

Positioning tape ...
Installing custom data files ...
Creating file lists ...
Extracting SCO UNIX System V Extended Utilities Files ...
```

If you have the CD-ROM distribution, you are prompted similarly.

If you have the floppy disk distribution, you are prompted to insert the
appropriate X volumes.

At each prompt, insert the appropriate volume, and press ⟨Return⟩.

Next, the system displays messages specific to the installed packages. The
screen display includes messages similar to the following, which corresponds
to the LPR (line printer spooler) and MAIL packages, if installed:

```
Configuring Link Kit to the devices found ...

Setting up printer terminfo database ...

Converting mmdftailor file ...
```

This is followed by:

```
Checking file permissions ...
```

27. Then, the following screen is displayed:

```
Restoring perms files ...

Restoring saved files ...

Is your current system in relaxed security mode? (y/n)
```

- Enter **y** to set your updated system's security level to the Version 4.0 equivalent which is the "Traditional UNIX System" level defaults or

- enter **n** to set the new system level to the "Improved Security" level defaults.

For the updated system to have the same security level as the pre-update system, select **y** or **n** to choose the correct level defaults. This release of SCO UNIX System V provides four levels of security for your system. You can configure your system to operate at any of these levels after this initial installation process. For more information on your systems' security, see "Maintaining system security" in the *System Administrator's Guide*.

After selection, the screen displays:

```
Setting security mode ...
```

28. **If the Link Kit was not extracted**, proceed to step 30.

   If the Link Kit package was extracted, either because you have installed the system using BTLDs or because your previous system had the Link Kit installed, it now has to be updated with the new system configuration. Continue with this step.

   The following screen is displayed:

```
Updating the Link Kit ...
```

   The operating system is now rebuilt. This is done *only* if the pre-update system had a Link Kit installed or boot-time loadable drivers were used in this installation.

   If BTLD was used, the operating system is rebuilt. Proceed to the section, "Adding BTLDs to the Link Kit," of Appendix B "Using boot-time loadable drivers" to continue your installation. On completion, return to step 29.

29. The following messages are displayed:

```
The UNIX Operating System will now be rebuilt.
This will take a few minutes.  Please wait.

Root for this system build is /.
```

The configuration choices that you made during the installation are being added to the system. As the system continues to rebuild, you see these messages:

```
The UNIX Kernel has been rebuilt
Backing up /unix to /unix.old
Installing new /unix
Setting up new kernel environment
```

30. Next, the following message is displayed:

```
Restoring file permissions ...
```

If your previous system had the on-line manual pages package (MAN) installed, you see the following message displayed:

```
Cleaning up manual pages ...
```

31. Next, you see:

```
The Update installation will be completed by executing fsck on the
root filesystem.  After this, the system will automatically reboot
the updated system from the hard disk.

Remove the floppy disk from the drive and press <Return>:
```

Remove the floppy from the drive and press ⟨Return⟩ to complete the Update installation procedure.

fsck(ADM) is now performed on the *root* filesystem. This makes the final modifications to the *root* filesystem for the update and displays progress messages on the screen. After this, your SCO UNIX System V Release 3.2 Operating System Version 4.0 is ready.

The system displays the resulting **fsck**(ADM) prompt:

```
*** ROOT FILESYSTEM WAS MODIFIED ***
*** SYSTEM WILL REBOOT AUTOMATICALLY ***
```

Updating system files

After rebooting the updated system, if you wish to perform any system file updates, you have to check all the configurable system files and decide if your system requires these modifications.

This section lists all the files that could have been modified on the pre-update system. To identify the modified files, you have to check all the files in this section. **Only** files that are paired as shown in the table later in this section contain any user configuration.

The files are divided into two sections: the displaced Version 2.0 files and the retained Version 2.0 files. The displaced files are Version 2.0 files that have been replaced by Version 4.0 files; the retained files are Version 2.0 files that the system needs for the successful installation of this Version 4.0 software.

To check for modifications, use the **diff**(C) command on both versions of the files and then merge in the modifications, if required. For more information on the **diff**(C) command, see your *User's Reference*. For example, the file */etc/profile* is the original Version 2.0 file and the new Version 4.0 file has been renamed */etc/profile.new*. If you wish to use the new Version 4.0 file, then the user modifications from the old file need to be merged into this new file. To do this, type:

diff /etc/profile /etc/profile.new > /etc/profile.diff

The changes between these two files are placed in the file */etc/profile.diff*. These changes are the user modifications that can be merged into the *.new* file. After the merge, the Version 2.0 file must be deleted or moved to */etc/profile.old* and the *.new* file moved to */etc/profile*.

- retained files

  Table 3-1 lists the Version 2.0 files that are left in the updated system, if previously modified. The first column contains the Version 2.0 files that the operating system needs (because they contain specific user modifications), and the second column contains the new Version 4.0 files. The new files are placed in *filename.new* or *filename_*.

Table 3-1 Retained files

Version 2.0	Version 4.0
/etc/cshrc	/etc/cshrc.new
/etc/profile	/etc/profile.new
/etc/termcap	/etc/termcap_
/usr/lib/terminfo/terminfo.src	/usr/lib/terminfo/terminfo.new
/usr/lib/uucp/uudemon.admin	/usr/lib/uucp/uudemon.admin_
/usr/lib/uucp/uudemon.clean	/usr/lib/uucp/uudemon.clean_
/usr/lib/uucp/uudemon.hour	/usr/lib/uucp/uudemon.hour_
/usr/lib/uucp/uudemon.poll	/usr/lib/uucp/uudemon.poll_
/usr/lib/uucp/uudemon.poll2	/usr/lib/uucp/uudemon.poll2_
/usr/lib/uucp/Dialers	/usr/lib/uucp/Dialers_
/usr/lib/uucp/dialHA12	/usr/lib/uucp/dialHA12_
/usr/lib/uucp/dialHA12.c	/usr/lib/uucp/dialHA12.c_
/usr/lib/uucp/dialHA24	/usr/lib/uucp/dialHA24_
/usr/lib/uucp/dialHA24.c	/usr/lib/uucp/dialHA24.c_
/usr/lib/uucp/dialMUL	/usr/lib/uucp/dialMUL_
/usr/lib/uucp/dialMUL.c	/usr/lib/uucp/dialMUL.c_
/usr/lib/uucp/dialBIT	/usr/lib/uucp/dialBIT_
/usr/lib/uucp/dialBIT.c	/usr/lib/uucp/dialBIT.c_
/usr/lib/uucp/dialVA3450	/usr/lib/uucp/dialVA3450_
/usr/lib/uucp/dialVA3450.c	/usr/lib/uucp/dialVA3450.c_
/usr/lib/uucp/remote.unknow	/usr/lib/uucp/remote.unknow_

- If your previous system (Version 2.0) contained the Link Kit, then the update process creates a directory, */etc/conf/up.sav*, and saves the following Version 2.0 files and directories in it. The contents of this *up.sav* directory can be used for manually retuning the updated Link Kit when incompatible device drivers are reinstalled after the Update.

  - The files are listed here:

    init.base, inittab, mdevice, mscsi, mtune, sdevice and *stune*

  - and the directories are:

    init.d and *node.d*.

- displaced files

  Table 3-2 lists the Version 2.0 files that have been displaced by the Version 4.0 files (because these Version 4.0 files are required). The first column contains the Version 4.0 files and the second contains the Version 2.0 files that have been displaced and renamed *filename.old*.

Table 3-2   Displaced files

Version 4.0	Version 2.0
/etc/rc*.d	/etc/rc.old/rc*.d
/etc/auth/system/files	/etc/auth/system/files.old
/etc/auth/system/authorize	/etc/auth/system/authorize.old

The */etc/rc*.d* refers to the contents (like the *rc0.d* and *rc1.d* directories and resident files) of the directories, and the other two files refer to the new files the system needs to use the modified security system for this release.

- After the Update installation, which updates *only* the *root* filesystem from Version 2.0 to Version 4.0 of the software, you can set your separate filesystems (for example, */u*) to support "long filenames" and "symbolic links" features by typing:

    **fsck -E /dev/*node.name*

See the chapter titled "New features and enhancements in this release" of your *Release Notes* for more information on these new features.

Aborting the update

If you wish to revert back to your Version 2.0 system after step 21 in the Update installation procedure, follow the steps in this section.

1. Quit the update process by turning the system off and then on again.

2. When the boot prompt is displayed, insert your N1 floppy and enter **restart** to start the installation from the beginning.

3. Install your SCO UNIX System V Release 3.2 Operating System Version 2.0 distribution as requested in the *Installation Guide* for that version.

4. Initialize your hard disk using the Fully Configurable option.

    Do *not* make any modifications to the size of your UNIX system partition or disk layout.

5. Continue the installation of the SCO UNIX System V distribution by the usual method.

6. After the installation, restore the *root* filesystem from the backup copy you made at the beginning of the Update. If you have restored this *root* filesystem to a temporary area, overwrite the partially updated *root* filesystem with your restored version.

    Your system is now back to the pre-update state. Clean up the filesystem by restoring any backed up directories and files.

A

Appendix A

Creating and formatting a physical DOS partition

If you want a physical DOS partition on your UNIX system, you should create one before you install the system. Creating a DOS partition after you have installed your SCO UNIX System V Operating System requires considerable effort: you must first back up your hard disk, create the DOS partition, then reinstall your SCO UNIX System V software and all applications.

Use the utilities and documentation packaged with your computer hardware to create and format a DOS partition.

The following restrictions apply when creating a DOS partition:

* Always install the DOS partition first; some older versions of DOS allow the DOS partition to start on the first cylinder only. The DOS partition should be the first partition on the first disk. Any versions prior to and including DOS 3.3 must adhere to this recommendation. DOS 4.01 does not have this restriction.

* Always format your new DOS partition with the MS-DOS command:

    format *drive* **/s /v**

    This command formats the disk in the specified *drive* to accept MS-DOS files. The **/s** option copies the operating system files listed in the MS-DOS file *formats.tbl* from the diskette to the specified *drive*. The **/v:** option prompts for the volume label to use. A volume label identifies the disk and can contain up to 11 characters. For DOS 4.01, a volume serial number is automatically generated when you format a disk.

    NOTE The MS-DOS **format** command is not the same as a low-level format.

- Always make sure that the size of your UNIX system partition is a multiple of the number of heads on the hard disk. (If you remapped the drive during a low-level format of the disk, use the mapped number of heads.) Otherwise, UNIX system **fdisk** warns that the UNIX system partition is not on a cylinder boundary.

- Never begin the UNIX system partition on the track immediately following the last track of the MS-DOS partition. As MS-DOS does not expect another operating system after its last track, it sometimes uses that space to store programs temporarily. If you install the UNIX system partition directly after the DOS partition, you may lose the boot BLOCK.

- Your DOS partition should have a minimum size of 2.5 Mbytes; some DOS copy-protection schemes do not install on a partition smaller than 2.5 Mbytes.

- Never use a third party disk partitioning product, such as Disk Manager, to partition the hard disk before installing MS-DOS and the UNIX system. Use MS-DOS **fdisk** to partition MS-DOS, and UNIX system **fdisk** to partition the UNIX system.

NOTE If the preceding restrictions are not applied, you must begin again with a low-level format of your hard disk, install DOS and then reinstall the UNIX system.

Low-level format programs

If necessary, use a program such as **DOS-Debug** or **Speedstor** to perform a low-level format of the disk. Many ESDI and SCSI disk controllers have on board BIOS routines. You can use these routines to perform a low-level format of your disk.

Follow these steps:

1. Boot MS-DOS.

2. At the DOS prompt, enter:

    debug

3. Depending on your disk controller, enter one of the following commands at the "-" prompt:

    - for Adaptec SCSI controllers:

      g=dc00:6

    - for ESDI controllers:

      g=c800:5

    See your computer and/or controller documentation for more details.

Converting fdisk numbers

DOS 3.3 **fdisk** uses cylinders (both DOS 4.0 and 5.0 use Mbytes) and UNIX **fdisk**(ADM) uses tracks. If you know the number of tracks per cylinder, you can use consistent numbers when using the two different versions of **fdisk** .

To obtain these numbers, you must know the total number of tracks and cylinders. UNIX **fdisk** lists the total number of tracks; the total number of cylinders should be listed in the documentation for your hard disk. Divide the total number of tracks by the total number of cylinders. If you need to convert track or cylinder information to megabytes, divide the total number of tracks or cylinders by the disk size.

Appendix B

Using boot-time loadable drivers

This appendix describes how to use your Boot-Time Loadable device Drivers (BTLDs) disk on your SCO UNIX System V Operating System.

BTLDs are installable in two different ways:

- As a package of drivers to be boot-time loaded by **boot**(HW).

  This is typically for installing new hardware which is required for your system at installation time.

- As a package of drivers to be added to the Link Kit by **installpkg**(ADM).

  For installing new hardware which you wish to add to your system after the initial installation of the SCO UNIX System V Operating System software.

Defining boot-time loading

Boot-time loadable drivers are drivers which can be link-edited into the UNIX system kernel during the booting process. The link-editing is done by **boot**(HW) after the driver is loaded into memory (RAM) but before the kernel is started.

A BTLD enables SCO UNIX System V to be installed either onto, or using, new hardware as soon as a driver for the hardware is available. For example, a boot-time loadable SCSI host adapter driver allows SCO UNIX System V to be installed on a new SCSI hard disk model as soon as the disk and the driver are shipped, rather than having to wait until shipment of a new or enhanced SCO UNIX System V Operating System.

The BTLD disk provided by the third-party manufacturer is all you need to use this facility; no additional software is required to use BTLDs since **boot**(HW) is part of the SCO UNIX System V Operating System.

When to use BTLDs

The SCO UNIX System V installation uses two floppies known as N1 and N2. These floppies contain a full bootstrap procedure (used by **boot**(ADM)), a minimal UNIX system kernel, a minimal root filesystem, and the installation scripts.

The minimal kernel contains drivers for a wide range of hardware. Another driver should be boot-time loaded *only* if the minimal kernel does not contain a suitable driver, and the driver must be used to install SCO UNIX System V.

Typically then, only drivers for:

- the primary hard disk
- the cartridge tape (needed only if you have the tape distribution)
- CD-ROM disc (needed only if you have the CD-ROM distribution)

will need to be boot-time loaded. These drivers should be boot-time loaded only if SCO UNIX System V is being installed on such hardware, and the minimal kernel does not already contain an adequate driver.

Using BTLDs at installation time

This section describes how to install your new hardware which is required for the installation.

Boot-time loading in memory

This section describes how to link your boot-time loadable drivers into the kernel built in memory.

1. Enter **link** at the "Boot:" prompt.

2. The screen displays the following prompt:

```
What packages do you need linked in the system,
or 'q' to quit? :
```

Enter *only* packages which are required by the installation: for example, your hard disk or installation medium, if either of these are BTLDs.

3. Next, you see the following boot line:

```
fd(64)unix root=fd(96) swap=ram(0) swaplo=0 nswap=16 ronly mem=/plink=pkg btld=fd(x)

Memory found: 0k - 640k, 1m - 9600k
```

pkg in the line above is replaced by the actual name of the driver package for boot-time loading and *x* is replaced by the minor number for your floppy device.

After a moment, a series of prompts are displayed with trailing dots:

```
Loading kernel fd(x)unix .text
.....................................................
.....................................................
.....................................................
.....................................................
Loading kernel fd(x)unix .data
.......................................
Loading kernel fd(x)unix .bss
```

These progress messages continue as software is loaded.

4. Next you see,

```
Please insert the fd(x)pkg volume and press <Return>:
```

Insert the requested volume.

- If the wrong volume is inserted or the drive is empty, the system displays the following:

```
Sorry, that volume does not contain the pkg package
```

followed by the insertion request again:

```
Please insert the fd(x)pkg volume and press <Return>:
```

The system prompts for and extracts the contents of each package. The information displayed depends on the structure of the disk. If a floppy contains more than one package, press ⟨Return⟩ again to continue when you are prompted for the next volume.

5. **boot**(HW) performs the linking of the extracted drivers into the kernel in core and may require more information for the extracted drivers. If the system prompts you for more information about configuring in these drivers, then see the **boot**(HW) section in *System Administrator's Reference* in this documentation set.

   | **NOTE** If there are any errors during this extraction (linking) process, the process is aborted and you are forced to reboot.

   If a floppy contains more than one package, when prompted to insert the next volume, simply press ⟨Return⟩ to continue.

6. For the Fresh installation, return to step 4 of Chapter 2, "Running the fresh installation" and for the Update installation, return to step 10 of Chapter 3, "Running the update installation."

Loading drivers onto the hard disk

Currently, the hard disk and installation medium are properly initialized and configured into the system. The root filesystem on the N2 floppy has also been extracted and placed in the root filesystem division of the UNIX partition on the hard disk. BTLDs which were boot-time loaded into memory (RAM) earlier *must* be extracted again at this point.

Any BTLD can be loaded into the hard disk at this stage for subsequent linking into the new kernel. The Link Kit package performs the linking at the end of the installation procedure.

The installation-dependent drivers, for example, for the hard disk, will also need to be extracted at this point. The previous extractions of these drivers into memory (RAM) enabled the successful installation and configuration of the system with drivers (BTLD) not shipped as part of the standard SCO UNIX System V/386 distribution.

1. After the N1 floppy extraction onto hard disk, the following screen displays:

```
The BTLD packages will now be extracted.

Please insert the "pkg" volume
and press ⟨Return⟩:
```

Insert the floppy volume containing the required package and press ⟨Return⟩ as requested. The entire contents of the disk are copied and stored on the system for later usage.

2. Next, you see the following:

```
Extracting BTLD packages ...
```

After the required packages have been extracted, return to the appropriate chapter of this guide to continue the installation.

For the Fresh installation, return to step 15 of Chapter 2, "Running the fresh installation" and for the Update installation, return to step 19 of Chapter 3, "Running the update installation".

Adding BTLDs to the Link Kit

The packages which were extracted previously and stored on the system will need to added to the Link Kit at this point. These packages will be added to the new kernel built by the Link Kit.

For the Fresh installation, if your previous system did not have a Link Kit installed, the process will non-interactively extract it at this stage.

1. The system displays a screen similar to the following:

```
The BTLD packages will now be added to the Link Kit.

The following packages are on this disk:

NAME    DESCRIPTION
pkg1    kolax's CD-ROM driver
pkg2    dipner's Hard Disk driver

Please enter the names of the packages you
wish to install, or q to quit
[default: pkg1]:
```

All the extracted packages are displayed similarly to that above. The system provides a default package which can be installed by pressing ⟨Return⟩.

Next, you see the following messages:

```
Installing pkg1

Installing device: cd-rom

Installed pkg1
```

The package has now been added to the Link Kit. The new UNIX system kernel will now be rebuilt and the Link Kit will be used to add your boot-time loaded drivers into the new system.

2. To continue the installation, return to the appropriate step in the installation procedure.

For the Fresh installation, return to step 44 of Chapter 2, "Running the fresh installation," and for the Update installation, return to step 29 of Chapter 3, "Running the update installation."

Installing BTLDs after initial installation

This section describes how to add your BTLDs into the kernel using the Link Kit. This is performed on your already installed system, that is, BTLDs for devices that were not required during the installation process. **installpkg**(ADM) is used to perform this installation.

1. At the system prompt, enter **installpkg**.

2. The screen displays the following messages:

```
Confirm

Please insert the floppy disk.

If the program installation requires more than one floppy
disk, be sure to insert the disks in the proper order,
starting with disk 1.
After the first floppy disk, instructions will be provided
for inserting the remaining floppy disks.

Strike ENTER when ready
or ESC to stop.
```

Insert the requested disk containing the required driver packages and press ⟨Return⟩.

3. First, you see the following message:

```
Installation is in progress -- do not remove the floppy disk.
```

After a few moments, the system lists all the packages on this BTLD disk and prompts you for your required package(s) on a screen display similar to the following:

```
The following packages are on this disk:

NAME    DESCRIPTION
pkg1    kolax's new CD-ROM driver
pkg2    dipner's second Hard Disk driver

Please enter the names of the packages you
wish to install, or q to quit:
```

After selecting your package(s), you see a screen similar to the following:

```
Installing pkg1

Installing device: cd-rom

Installed pkg1
```

The new driver has now been loaded into the Link Kit for kernel addition.

Appendix C

Running the configurable disk initialization

This appendix describes how to initialize the hard disk manually, including configuring non-standard hard disks (disks for which there is no existing entry in the ROM BIOS). This involves dividing the disk into partitions (separate areas occupied by different operating systems), mapping bad spots (bad tracks) on the UNIX partition so that the operating system can avoid them, and dividing the UNIX partition into divisions (separate areas for file-system directories or raw storage under the same operating system).

There are three types of hard disks and controllers: ST506 (standard), ESDI, and SCSI. (Refer to Appendix A, "Compatible hardware," of your *Release Notes* for more information on disk and controller types.) The ESDI and SCSI disks and controllers may have certain steps that do not apply to standard disks; these steps are clearly indicated. Special instructions for ESDI controllers apply to OMTI only.

All ESDI controllers other than OMTI (for example, WD 1007, DTC 6280, and Adaptec 2320/2322) use the ST506 interface.

Hard disk initialization checklist

Use this checklist to gather information you need before beginning the Fully Configurable hard disk initialization procedure. For information on choosing the amount of space to allocate for swap space, see the section "Determining swap space allocation" later in this appendix.

NOTE If you have a SCSI host adapter, skip items 1 and 3; the SCSI configuration does not call **/etc/dkinit** or BADTRK.

Hard disk initialization checklist

---

1. Disk Parameters (dkinit)   ST506/ESDI and
                                      OMTI ESDI only

   Cylinders: _____
   Heads: _____
   Write Reduce: _____
   Write Precomp: _____
   Ecc: _____
   Control: _____
   Landing Zone: _____
   Sectors/track: _____

2. Partition (fdisk)   All controllers

   Partition Status: ☐ Inactive
                                      ☐ Active

   Start: _____
   End: _____
   Size: _____

3. Scan Disk (badtrk)   ST506 and
                                      non-OMTI ESDI only

   ☐ Entire UNIX Partition
   ☐ Range of Tracks: _____
   ☐ Filesystem: _____
   ☐ Quick Scan
   ☐ Thorough Scan
   Destructive: ☐ Yes
                                      ☐ No

   Modify Badtrack Table:
   ☐ Add Entries by Cylinder/Head
   ☐ Add Entries by Sector Number
   ☐ Delete Individual Entries
   ☐ Delete All Entries

4. Filesystem Layout (divvy)   All Controllers

   Swap Space Allocation:
   ☐ Default
   ☐ Specify (Blocks):   _____

Initializing your hard disk

Once you complete the Hard Disk Initialization Checklist, you are ready to start the Fully Configurable hard disk initialization. The procedure is as follows:

1. First, the system detects the type of controller and disk you have installed and displays messages similar to this example (for a SCSI configuration):

```
%disk    -      -       -         type=S   ha=0      id=0       lun=0
%Sdsk    -      -       -         cyls=80  hds=64    secs=32
```

Only one line is displayed for non-SCSI disks.

2. Then, you see the following message:

```
During installation you may choose to overwrite all
or part of the present contents of your hard disk.

Do you wish to continue? (y/n)
```

This prompt allows you to stop the process if you have restarted the installation process by mistake. Enter **y** to continue.

3. **If you have a SCSI host adapter,** you see the following message:

```
The hard disk installation program will now invoke /etc/fdisk.
Entering 'q' at the following menu will exit /etc/fdisk.
and the hard disk installation will continue.

If you wish to exit the entire installation at this menu,
press the ⟨Del⟩ key.
```

Skip to step 10 of this procedure. The SCSI configuration skips steps 4 through 9.

4. **If you have an ST506 (standard) or non-OMTI ESDI controller,** you see the following menu:

```
The hard disk installation program will now invoke /etc/dkinit.
Entering 'q' at the following menu will exit /etc/dkinit,
and the hard disk installation will continue.

If you wish to exit the entire installation at this menu,
press the <Del> key.

Hard Disk Drive 0 Configuration

          1. Display current disk parameters
          2. Modify current disk parameters
          3. Select default disk parameters

Enter an option or 'q' to quit:
```

If you have an OMTI controller, you see this additional message:

```
Caution: Consult the ESDI installation Release Notes if
you wish to modify the disk parameters the /etc/dkinit
will display.
```

The DKINIT utility allows you to configure unusual or non-standard disks.

5. **If you have a standard hard disk** (one that is supported by your computer hardware or special motherboard ROM), enter **3** to select the default disk parameters. Unless you know that your disk is non-standard, assume that it is standard.

When you choose option 3, the Hard Disk Configuration menu is displayed again. Select **q**.

Now, you see the following message:

```
The hard disk installation program will now invoke two disk
preparation utilities:  fdisk and badtrk.
Selecting 'q' at the main menu for each utility will exit
that utility and continue with the hard
disk installation.
```

Skip to step 9.

6. **If your disk is non-standard**, you must modify the ROM disk configuration information. For example, if you are installing an ESDI controller that uses the ST506 interface, the cylinder value may be too low. If you are unsure of what parameters to enter for your non-standard disk, contact your disk manufacturer for this information. The **dkinit** program uses BIOS parameters that should be documented in the hardware manual for your computer.

> **NOTE** If the disk controller is translating the disk geometry, enter the *translated* parameters.

To modify the disk parameters, enter **2**. You see a display like the following:

```
Disk    Parameters      Values
1.      Cylinders       value
2.      Heads           value
3.      Write Reduce    value
4.      Write Precomp   value
5.      Ecc             value
6.      Control         value
7.      Landing Zone    value
8.      Sectors/track   value
```

In the actual display, *value* is replaced with the default value for that parameter.

> **NOTE** The "Cylinders" value refers to the number of cylinders on the entire hard disk and should not to be confused with the number of cylinders you allocated (or intend to allocate) to a given partition.

Now, you see the following prompt:

```
Enter a parameter to modify or 'q' to return to the main menu:
```

Select the number that corresponds to the disk parameter that you want to modify. If you enter **q**, you return to the previous menu.

7. If you entered a number, you see the following:

```
Enter the new value or <Return> to use the existing value:
```

If you wish to change the value, enter a new value now or press ⟨Return⟩ to use the existing value.

You see this prompt again:

```
Enter a parameter to modify or 'q' to return to the main menu:
```

You can continue to change disk parameters until they all have the values you require.

8. After you finish changing the disk parameters, enter **q** to return to the main menu.

9. Next, enter **q** again to save the changes you made. When you select **q** to exit the **dkinit** utility, you update the parameters with the new values that you specified. If you wish to restore the default parameters after making modifications, enter **3** from the Hard Disk Drive Configuration menu.

10. The installation program next runs the **fdisk**(ADM) utility to partition the hard disk. You can partition your disk to support DOS on the same hard disk (if you already have DOS installed), or you can use the whole disk for your UNIX system.

The **fdisk** menu appears on the screen:

```
To exit the entire installation at these menus, press the ⟨Del⟩ key.

     1. Display Partition Table
     2. Use Entire Disk for UNIX
     3. Use Rest of Disk for UNIX
     4. Create UNIX Partition
     5. Activate Partition
     6. Delete Partition

Enter your choice or q to quit:
```

Select option **1** and press ⟨Return⟩.

If you have never installed an operating system on your disk, you see a table similar to this:

```
Current Hard Disk Drive: /dev/rhd00

 ┌───────────┬────────┬──────┬───────┬─────┬──────┐
 │ Partition │ Status │ Type │ Start │ End │ Size │
 │           │        │      │       │     │      │
 └───────────┴────────┴──────┴───────┴─────┴──────┘

Total disk size: 1220 tracks (5 reserved for masterboot and diagnostics)
Press ⟨Return⟩ to continue
```

If you have previously installed an operating system on your disk, the **fdisk** table is already filled in. DOS is usually displayed as partition number 4.

11. Press ⟨Return⟩ to return to the main **fdisk** menu. If you would like the UNIX partition to occupy the whole disk, select option **2**. If any other operating systems were previously installed on your system, you see the following warning message:

```
Warning! All data on your disk will be lost!
Do you wish to continue? (y/n)
```

If you want your UNIX system to occupy the whole disk, enter **y**. This ensures that **fdisk** partitions the whole disk.

> **NOTE** After you have chosen option **3**, which allocates the remainder of the hard disk for the UNIX system, you must now activate the UNIX partition by selecting option **5**. If you do not activate the UNIX partition, your first partition is activated.
>
> Most computers have diagnostic programs that write to the last cylinder of the hard disk. Therefore, you should not allocate the last cylinder to a partition. When you choose option **2** from the **fdisk** menu, the last cylinder is not allocated. However, if you choose option **4**, you should make sure that you do not allocate the last cylinder of the hard disk to the UNIX partition.

12. Press ⟨Return⟩, and you see the main **fdisk** menu. You have now set up the partition(s) on your hard disk. To exit **fdisk** and continue with the next step in the installation procedure, enter **q**.

13. **If you have an ST506 or non-OMTI ESDI controller**, you see the main **badtrk**(ADM) menu:

```
1. Print Current Bad Track Table
2. Scan Disk (You may choose Read-Only or Destructive later)
3. Add Entries to Current Bad Track Table by Cylinder/Head Number
4. Add Entries to Current Bad Track Table by Sector Number
5. Delete Entries Individually from Current Bad Track Table
6. Delete All Entries from Bad Track Table

Please enter your choice or 'q' to quit:
```

Select option **2**.

Using the **badtrk** program, you can scan your hard disk for defective tracks. The program maps any flawed locations to good tracks elsewhere on the disk. This utility also creates a bad track table, which is a list of all the bad tracks on your hard disk.

If you have a SCSI host adapter, skip to step 23. The SCSI installation does not run **badtrk**.

14. You see the following menu:

```
1. Scan entire UNIX partition
2. Scan a specified range of tracks
3. Scan a specified filesystem

Please enter your choice or 'q' to quit:
```

Select option **1**.

15. After you select the area you want to scan, you see the following prompt:

```
1. Quick scan (approximately 7 megabytes/min)
2. Thorough scan (approximately 1 megabyte/min)

Please enter your choice or 'q' to quit:
```

> **NOTE** The times listed are approximate; scanning a particularly fast disk might take significantly less time.

Select option 2.

16. You are prompted:

```
Do you want this to be a destructive scan? (y/n)
```

Enter **y**.

17. The following warning message is displayed:

```
This will destroy the present contents of the region you are scanning.
Do you wish to continue? (y/n)
```

Enter **y**. You see the following message:

```
Scanning in progress, press 'q' to interrupt at any time.
Destructively scanning track x/y , n % of scan completed
```

18. After you respond to the prompts from **badtrk**, the program scans the active partition of the new disk for flaws. The larger your disk, the longer the scanning process takes; a very large disk might take a long time to scan.

As **badtrk** scans the disk, you see the number of each track it examines, and the percentage of the disk already scanned. You can interrupt the scan at any time by pressing the **q** key. You are then prompted to press ⟨Return⟩ to continue scanning or **q** to return to the main **badtrk** menu.

Whenever **badtrk** finds a defective track, it lists the location of that track using both the SECTOR number and cylinder/head conventions. The **badtrk** utility enters defective track information into the table and displays it on the screen. Here is an example of a bad track message:

```
WARNING : wd: on fixed disk ctlr=0 dev=0/47 block=31434 cmd=00000020
status=00005180, sector = 62899, cylinder/head = 483/4
```

19. When the scan is complete, the **badtrk** menu reappears. To see the results of the scan, select option **1**. Your bad track table looks something like this:

```
Defective Tracks:

     Cylinder   Head   Sector Number(s)
1.      190      3         12971-12987


Press ⟨Return⟩ to continue:
```

Press ⟨Return⟩ to return to the main menu.

> **NOTE**   If there is a flaw in the first few tracks of the UNIX partition, you return to the **fdisk** utility (step 10). The reason for this is that the utilities involved in the early stages of the UNIX boot process read from the first tracks of the partition; they do not understand the bad track table and cannot avoid these bad tracks.
>
> Repartition the disk with **fdisk** so that the UNIX partition no longer includes the defective tracks. You must experiment to determine how many tracks to exclude. Leave these defective tracks unassigned to any operating system. When you leave **fdisk**, **badtrk** runs again and you should scan the disk for further flaws.
>
> This process continues until **badtrk** finds no flaws in the first few tracks.

20. **If your disk comes with a flaw map,** enter any flaws from it into the bad track table.

> **NOTE**   If you used "mapping", "translating", or "63-sector" mode while performing a low-level format of your disk, the disk parameters used by the operating system do not reflect the physical parameters of the disk. Most ESDI controllers allow you to remap the drive.
>
> If this is the case, do not manually enter the flaws from the flaw map into the bad track table.

Because most disk flaws are marginal or intermittent, your disk's flaw map probably lists more bad tracks than the scanning process reveals. If so, you should now add these defective tracks to the bad track table.

Select either option 3 or option 4 depending upon the format of the flaw map furnished with your disk. Enter the defective tracks, one per line. If you make a mistake, enter **q**. You return to the main **badtrk** menu. Select option 5 to delete that track.

21. **If your disk is not furnished with a flaw map,** or you finish making changes to the bad track table, enter **q**.

22. Next, you are prompted for the number of tracks to allocate as replacements for those tracks that are flawed. Enter the number or just press ⟨Return⟩ to use the recommended number that is displayed. The recommended number is based on the number of bad tracks currently in the table, plus an allowance for tracks that may go bad in the future. You should allocate at least as many as the recommended number.

```
Enter the number of bad tracks to allocate space for
(or press ⟨Return⟩ to use the recommended value of n):
```

> **NOTE**   If you ever exceed the number of allocated bad tracks, you must reinstall the system.

- **If your system detected any new bad tracks**, you see the following prompt:

```
Do you want to update this device with the new table? (y/n)
```

Enter **y** to update your bad track table with the new information.

- Next, you see the following:

```
Do you want to attempt to salvage any valid data
on the bad tracks? [ may take a long time ] (y/n)
```

It is recommended that you enter **n** to ignore the data on these tracks because an attempted salvage could lead to corrupt data on your hard disk.

- On entering **n,** you see the following message:

```
Bad tracking successful
```

23. Once you have initialized your hard disk, the installation program runs the **divvy**(ADM) utility. Using **divvy** you can control the actual layout of your hard disk filesystems. This program allocates portions of your partitioned disk for the *root* and *swap* areas. The **divvy** utility also allocates a small portion of the disk for a *recover* area that is used during autoboot by the **fsck**(ADM) program.

First, **divvy** prompts you for the swap space allocation:

```
There are n 1K blocks in the UNIX area.
Between x and y 1K blocks should be reserved for the swap area.

Please enter the swap-space allocation, or press (Return)
to get the default allocation of z 1K blocks:
```

The actual numbers in this prompt vary depending upon the size of your disk. For more information on allocating swap space, see the section "Determining swap space allocation" later in this appendix.

> **NOTE** If you plan to install the Development System, enter a swap-area allocation that is at least 1000 blocks larger than the default.

Enter your swap space allocation now or press ⟨Return⟩ to choose the default values. Unless you have specialized needs, use the default values shown on your screen.

If you have enough disk space for a /u filesystem, you see the prompt:

```
Do you want a separate /u filesystem? (y/n)
```

If you do not want to create a separate user filesystem, respond **n** and proceed to the next step. If you have enough storage for a separate user filesystem, and want to create one, enter **y**. For more information on separate user filesystems, see the section, "Creating a separate (/u) filesystem" later in this appendix.

You see the following prompt:

```
Enter block allocation for the /u file system.
(min to max)
```

In the display, *min* and *max* refer to the minimum and maximum number of blocks that can be allocated for the filesystem. Specify the block allocation.

24. Now, you see the prompt:

```
The layout of the filesystems and swap area is now prepared.

Do you wish to make any manual adjustments to the sizes or
names of the filesystems or swap area before they are created
on the hard disk? (y/n)
```

This option allows you to choose the exact size of filesystems and the swap area to fit special needs.

Most users do not need this kind of precise control. Select **n** to use default settings based on the size of your hard disk.

The system now creates the filesystems and swap area on your hard disk. This takes several minutes. You see the following messages:

```
Making filesystems

Setting up hard disk root filesystem ...
Extracting files ...
```

25. Return to Chapter 2 of this guide and continue with step 9.

Determining swap space allocation

When the physical memory (RAM) is not large enough to contain all the running processes on the system, sleeping processes (tasks that are on hold while another process is being attended to) move to an area known as the "swap space". The swap space is a reserved portion of the hard disk that should be at least as large as the amount of RAM that you have installed. Swap space is allocated during the hard disk initialization procedure. Once you set the swap space size, it is very difficult to increase it without reinstalling SCO UNIX System V. If you are unsure of the eventual load on the system, overestimate the swap space.

Two methods for calculating the swap space size are described below.

Letting divvy(ADM) decide for you

If the system is used under typical multiuser operation (no large applications or the Development System), you can use the default swap space recommended during the initialization procedure.

After **badtrk**(ADM) has run, you are prompted to choose the amount of space to allocate for the swap space. The **divvy** utility calculates the minimum and maximum size of swap space to allocate based on the size of the hard disk, using the following formulas (where blocks are 1024 bytes, or 1 Kbyte):

If the UNIX partition is greater than:	But less than:	The default swap allocation is:
40 Mbytes*	50 Mbytes	20% of partition
51 Mbytes	139 Mbytes	10 Mbytes
140 Mbytes	–	10 Mbytes + (partition size-140)/10

* A UNIX partition size of less than 40 Mbytes is not recommended.

If you plan to install the Development System, enter a swap space size that is at least 1000 blocks larger than the default. This is particularly important if you are planning to use large applications like databases and spreadsheets, or make programs memory-resident for performance reasons.

Calculating the swap space yourself

Systems using major applications (a large relational database, for example) should allocate the swap space according to the following formula. (Use the worksheet provided at the end of this section to perform your calculations.)

1. Multiply the number of users on the machine by the size of the largest process (running program) that normally runs on the machine, in 1Kbytes.

2. Add 1 Mbyte to the amount of memory installed in your machine. Compare this result with the result from step 1. Use the larger number as your swap space size.

3. If multiple users are running different large applications, adjust the number upward, adding 1 Mbyte per different large application. (Consider the Development System to be a large application.)

For example, the calculations for an eight-user system with 4 Mbytes of memory with a typical mix of spreadsheet, database, word processor, and graphics package is similar to this:

1. 8 users x 1 Mbyte = 8 Mbytes.

2. 4 Mbytes memory installed + 1 Mbyte = 5 Mbytes, which is less than the number calculated in step 1.

3. There are 4 users using different large applications. 4 x 1 Mbyte = 4 Mbytes. Add this to the greater amount from steps 1 and 2 to obtain a reasonable calculation of swap space: 8 Mbytes + 4 Mbytes = 12 Mbytes. Because the operating system uses a block size of 1 Kbyte (KILOBYTE), this means that a swap space allocation of 12 Mbytes translates simply to 12000 blocks.

Swap space allocation worksheet

Use the following worksheet to perform the calculations discussed in the preceding section:

Swap space allocation				
1. Number of users:	_____	x 1 Mbyte	=	_____
2. Amount of RAM installed:	_____	+ 1 Mbyte	=	_____
3. Greater of (1) and (2):			=	_____
4. Number of large applications:	_____	x 1 Mbyte	=	_____
5. Sum of (3) and (4):			=	_____

Sizes of disk divisions	
DOS partition:	_____
UNIX partition:	_____
Swap space:	_____
/u filesystem:	_____

Creating a separate (/u) filesystem

If you are installing on a hard disk (or partition) that is larger than 240 Mbytes, you are asked to decide whether to divide the UNIX partition into two separate filesystems. Use separate filesystems if the size of your *root* filesystem and swap space subtracted from the size of your UNIX partition is greater than 20 Mbytes.

You can create additional filesystems even if your partition is smaller than 240 Mbytes; this is simply the automatic formula. This other filesystem is typically called */u*; however, it can be named anything you like except *root* or *swap* or *recover*. The */u* filesystem is typically used for user accounts and files. There are certain advantages and disadvantages to using a */u* filesystem.

There is no need to create a */u* filesystem if your setup is a runtime system (none or very few operating system packages installed) with a single dedicated application or with little user file storage.

Advantages of a /u filesystem

There are several advantages to separate filesystems:

- System backups are easier.

  In a typical system, user files can change often while UNIX utilities and system files usually remain unchanged once they are installed. Most users create and modify files in their home accounts frequently, so user accounts should be backed up often, while the *root* filesystem should only require an occasional backup. With separate filesystems, less media (for example, fewer floppy disks, fewer tapes, smaller tape size, and so on) are required to make backups of individual filesystems.

- Smaller filesystems are faster.

  File access is faster because the operating system has fewer inodes (file identifiers) and data blocks (filesystem subdivisions) to search. Each filesystem has its own inode and data block areas. Another reason is that when a system is shut down improperly ("crashes"), all filesystems are checked and cleaned using **fsck**(ADM). It takes less time to clean two smaller filesystems than one large filesystem.

- During a system crash, a less active filesystem usually sustains less damage than an active filesystem.

  By decreasing activity in the *root* filesystem, there is less chance of damage to it. The /u filesystem can be recreated easily by remaking it and restoring it from backups.

Disadvantages of a /u filesystem

There are two disadvantages, both relating to administration rather than performance:

- Once a division is made, it is impossible, or very time consuming, to change the size of, or delete, a filesystem. To do this, the entire UNIX system partition must be backed up, and the filesystem sizes changed using the **divvy**(ADM) utility; then the entire system must be restored from backups. This should only be done by an experienced system administrator. It is often easier to simply reinstall the software completely.

- There is a degree of additional operating system complexity introduced by an extra filesystem. This can make system administration more complicated for new administrators. This can include such mundane concerns as remembering to mount other filesystems if they are not mounted automatically at boot time.

Determining space for a /u filesystem

To determine if there is sufficient room on your hard disk for a /u filesystem, perform the calculations described in the following steps. (This formula is lengthy; study it here and then use the worksheet at the end of this section to perform your own calculations.)

1. Add together the sizes of all the operating system packages that you intend to install on your system. Package sizes (in 512 byte blocks) are found in the *Release Notes* under "Packages in this set."

2. Calculate the size for the */tmp* directory. */tmp* is used by many UNIX system programs as a temporary storage area. Allow at least half a megabyte per user. Add another half a megabyte per user to this number if some users will be using large databases, editing large files, or working on software development.

3. Be sure to include the disk size requirements for any applications on the *root* filesystem. Most applications usually list disk space requirements in their *Release Notes*.

4. Add the results of steps 1, 2, and 3. This represents the size of a completely full *root* filesystem.

5. In addition, 10-20% of the size of the *root* filesystem must be kept as free space after all the software is installed. Take 20% of the *root* filesystem size obtained in the previous step and add it to that number. As an example, assume the *root* filesystem is 40 Mbytes in size. To keep approximately 20% of it free, add 8 Mbytes to the *root* filesystem size, for a total of 48 Mbytes. When a filesystem becomes filled beyond this point, too much time is spent by the operating system finding free space when needed, causing performance to suffer.

6. Subtract the requirements for the *root* filesystem (as calculated in step 5) and swap space from the size of your UNIX partition (or size of your hard disk if the UNIX system is the sole occupant). You should have more than 10 Mbytes left on your hard disk before considering adding a /u filesystem.

7. Calculate the requirements for the /u filesystem. Allow at least 1.5 Mbytes of disk space per user on the /u filesystem. Add in the requirements for any databases in the /u filesystem. Database requirements depend upon the maximum size the files will reach, how many users will be using the database, and what files if any will be shared among the users of a database. Also, add the size of any applications that will reside in the /u filesystem. If the space needed for the /u filesystem is less than the number calculated in step 5, then you can safely add a /u filesystem.

8. Multiply the size in megabytes of the /u filesystem by 1000 to get the number of 1K blocks to allocate to the /u filesystem.

Separate (/u) filesystem worksheet

Use the following worksheet to perform the calculations discussed in the preceding sections.

Instructions	Calculation	Result
1. Sum of OS package sizes to be installed (converting 512-byte blocks to megabytes):	_____ / 2000	= _____
2. Number of users times ½ Mbyte per user:	_____ x .5 Mbyte	= _____
3. Number of users using database or Development System times ½ Mbyte per user:	_____ x .5 Mbyte	= _____
4. Add (2) and (3) for size of /tmp:	....	= _____
5. Disk requirements for applications:	....	= _____
6. Size of root filesystem: add (1), (4), & (5) plus 20%:	_____ x 1.2	= _____
7. Subtract size of swap space from UNIX partition:	_____ - _____	= _____
8. Subtract size of root filesystem (6) from available disk space (7):	_____ - _____	= _____
9. If (8) is less than 10 Mbytes, you cannot have a /u filesystem:	....	....
10. Number of users times 1½ Mbyte per user:	_____ x 1.5 Mbyte	= _____
11. Size of any database files to reside in /u:	....	= _____
12. Size of applications to reside in /u:	....	= _____
13. Add (10) through (12) for size of /u filesystem:	....	= _____
14. If /u (13) is less than (8), continue, else no /u:	....	....
15. Convert /u (13) size to blocks:	_____ x 1000	= _____

Appendix D

Setting time zones outside North America

This appendix describes how to set your time zone if you are not located in North America.

1. After the initial prompt described in the time zone procedure, step 18 of Chapter 2, "Running the Fresh Installation," you see the following:

```
What is the abbreviation of your standard time zone?
Enter 1-9 characters or enter q to quit:
```

Enter the abbreviation of your time zone and press ⟨Return⟩.

2. You then see the following:

```
How many hours west of Greenwich Mean Time are you?
Enter hh[:mm:ss] (e.g. 10:30:00 or 10:30, use negative
numbers for locations east of GMT) or enter q to quit:
```

Enter a number in the format of the example.

3. The following prompt is displayed:

```
Does summer time (daylight saving time) apply at your location (y/n)?
```

If daylight savings or standard time changes occur in your area, enter **y**. If not, enter **n** and proceed to step 8.

4. You then see the following:

```
What is the summer abbreviation of your time zone?
Enter 1-9 characters or enter q to quit:
```

Enter the summer abbreviation of your time zone.

5. Next, you see this prompt:

```
1. Week of the year (1-52).
2. Week of a specific month (eg. 1st week of April).
3. Day of the year, ie. Julian date (1-365).

Select the method your time zone uses to convert from
standard time to summer time (daylight saving time)
or enter q to quit:
```

Select the number that corresponds to the method that your time zone uses and follow the prompts as displayed. The next few screen prompts are dependent on your method of conversion.

You are prompted according to your method of conversion.

6. After entering the appropriate information for the previous screen prompts, you see the following:

```
At what time of day is the conversion made (use 24 hour clock)?
Enter hh[:mm:ss] or press RETURN for default value of 2 am
or enter q to quit:
```

Enter a number, following the format of the example, or press ⟨Return⟩ to select 2:00 A.M.

7. You then see the following prompt:

```
How many hours does your timezone adjust for summer time
(daylight saving time)?
Enter hh[:mm:ss] or press RETURN for the default value of 1 hour
or enter q to quit:
```

Enter a number or press ⟨Return⟩ to select one hour.

8. The time zone variable is now set in the */etc/TIMEZONE* file. There is no need to change the *.profile* for a user unless they call in from a different time zone and want to override the local standard.

    Next, the *terminfo* database is compiled and the following message is displayed:

    ```
    Setting up terminfo database ...
    ```

    The **terminfo**(M) database is now compiled. This takes a few moments.

9. Return to Chapter 2 and continue the installation at step 21.

Appendix E
Installing and removing additional software

The **custom**(ADM) utility installs and removes UNIX system software and applications on your system. **custom** has three levels of operation: Entire Product, Service, and Service Component. These levels function as follows:

Entire Product   The entire product distribution is installed. This selection installs new products.

Service   Groups of components that make up a functional area are installed.

Service Component An individual component, its packages, or individual files are installed. For example, the UNIX system Extended Utilities consists of several packages, such as MAIL (mail-related utilities) and LPR (printing utilities).

For example, an Entire Product can consist of several services. In turn, a Service Component can include a number of packages. A package is a collection of individual files. Files are extracted or deleted in packages. The Service and Service Component options only apply to the operating system packages.

The UNIX system consists of about twenty packages. This chapter explains how to do the following:

- install additional products.

- install packages of the UNIX system.

- remove software from the system.

If you have previously installed only selected packages of the UNIX system and you wish to install others, consult the "Installing UNIX system packages" section later in this appendix.

Installing additional products

This section describes how to install additional products or applications that are **custom**-installable.

1. To install additional products or applications, make the following sysadmsh selection:

    System ⇨ Software

2. The main **custom** menu is displayed:

```
                                                         Custom
  Install  Remove List Quit
 Install software
  /                                     Friday June 31, 1991 1:06

 ───────────────────── Products Currently Installed ──────────────
 SCO UNIX System V Operating System
```

The menu is already set to select Install; press ⟨Return⟩ to continue.

3. You see the next screen:

```
                                                          ▐Install▌
Select a product to install and press <Return>
Press <Esc> to cancel, movement keys are active
▐/                                             Friday June 31, 1991 1:06▌

                            ──── Install ────


    Select a product  :   [▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇▇]

    Choose an option  :    [ Entire Product ]   Packages   Files




                                ▐*A New Product                  ▌
                                │ SCO UNIX System V Operating System│
```
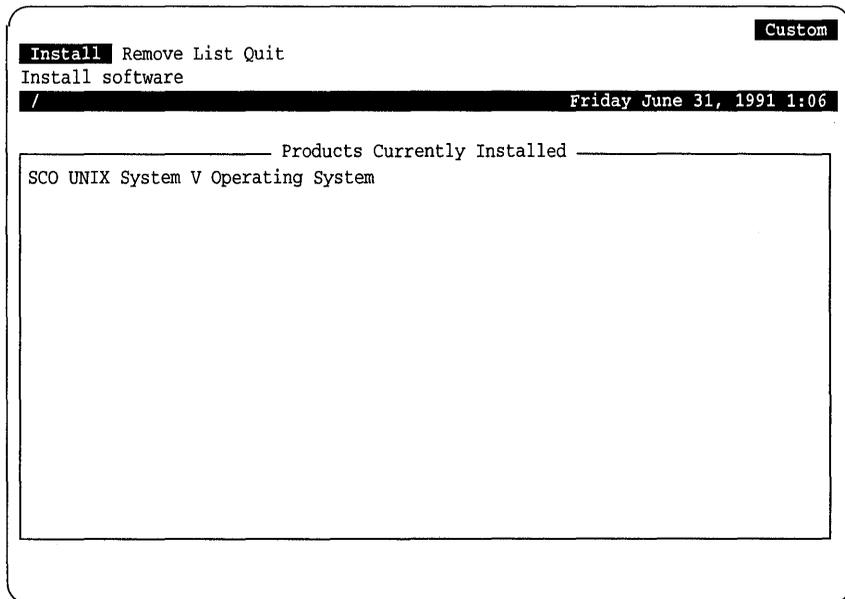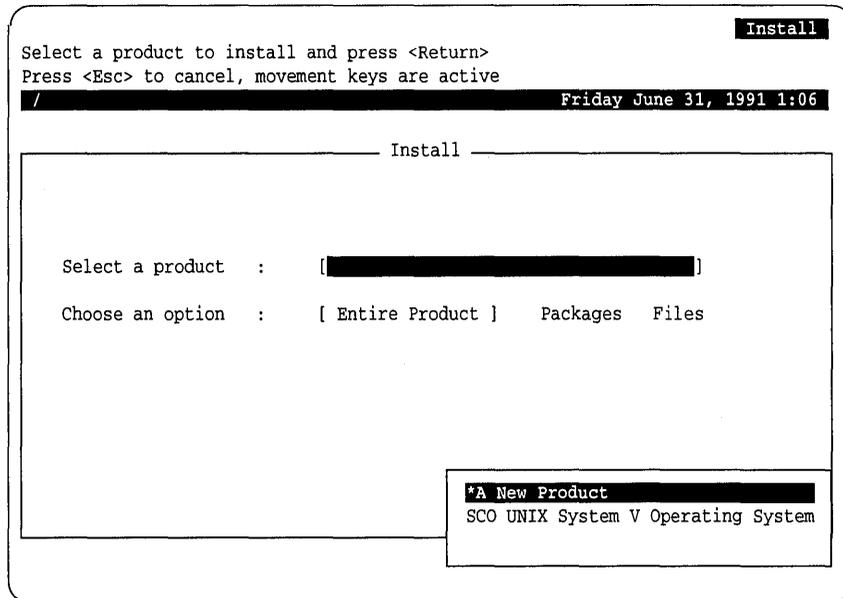
A New Product is highlighted. Press ⟨Return⟩ and the Entire Product
option is highlighted. Press ⟨Return⟩ once again.

4. The following menu is displayed:

```
                                                              Install

Insert the requested volume and press <Return> to continue the installation
/                                                   Friday June 31, 1991 1:06



      Insert:   Distribution
                Floppy Volume 1

      Continue  Quit
```
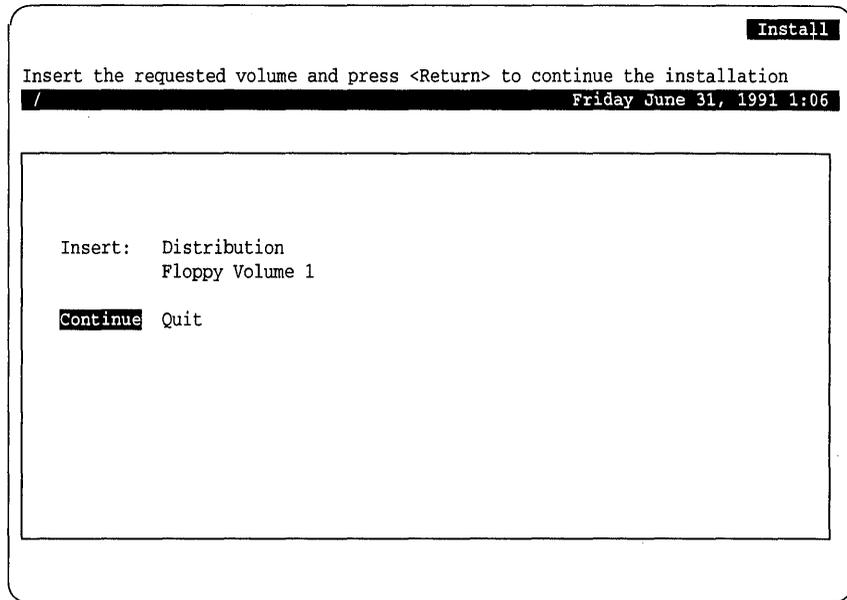
Insert the first disk of your product distribution as instructed and press ⟨Return⟩. Shortly after you do so, you are prompted again to insert the first volume, this time by its actual name. Simply press ⟨Return⟩ and insert additional volumes as prompted.

5. When the product installation is complete, you are returned to the **custom** menu. If you have finished installing additional products, exit **custom** by selecting Quit from the main **custom** menu and confirming your selection.

Installing UNIX system packages

This section describes how to install UNIX system packages.

1. To perform the installation, make the following **sysadmsh** selection:

      System ⇨ Software

2. The main **custom** menu is displayed:

```
                                                          Custom
  Install  Remove List Quit
  Install software
  /                                            Friday June 31, 1991 1:06

  ──────────────────── Currently Installed Products ────────────────────
  SCO UNIX System V Operating System
```

The menu is already set to select Install, for installing software; press ⟨Return⟩ to continue.

3. You see the next screen:

```
                                                                    Install
Select a product to install and press <Return>
Press <Esc> to cancel, movement keys are active
/                                              Friday June 31, 1991 1:06

                              ─── Install ───


     Select a product   :    [                                    ]

     Choose an option   :    [ Entire Product ]    Packages   Files




                                        *A New Product
                                        SCO UNIX System V Operating System

```
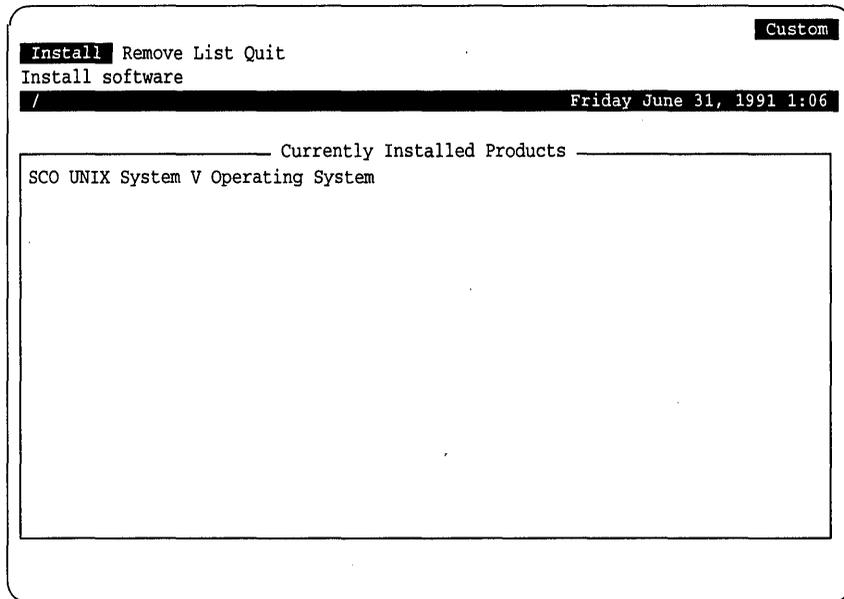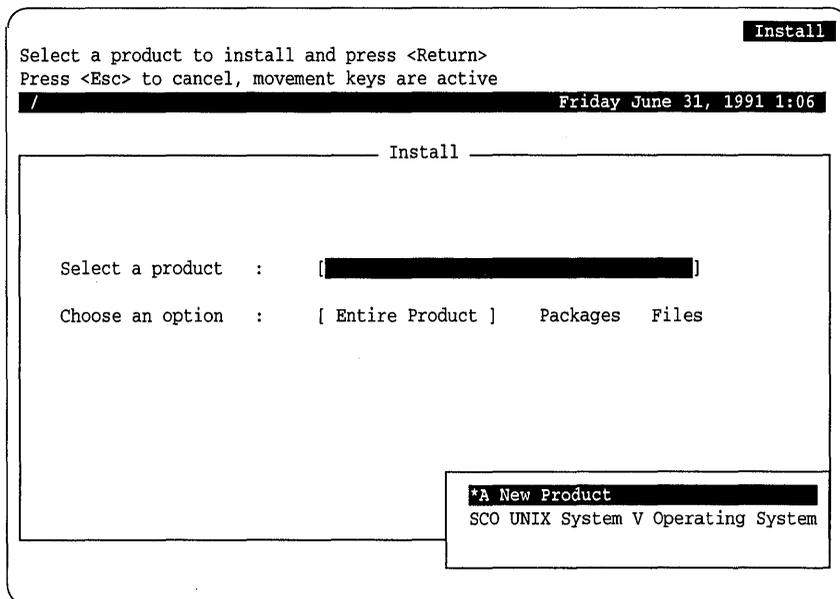
Use the ⟨Down Arrow⟩ key to highlight SCO UNIX System V Operating System and press ⟨Return⟩. The Entire Product option is then highlighted. If you want to install the entire operating system, you should press ⟨Return⟩ again. If you want to select the packages to install, use the ⟨Left Arrow⟩ key to highlight the Packages option and press ⟨Return⟩.

4. After a moment you see the following:
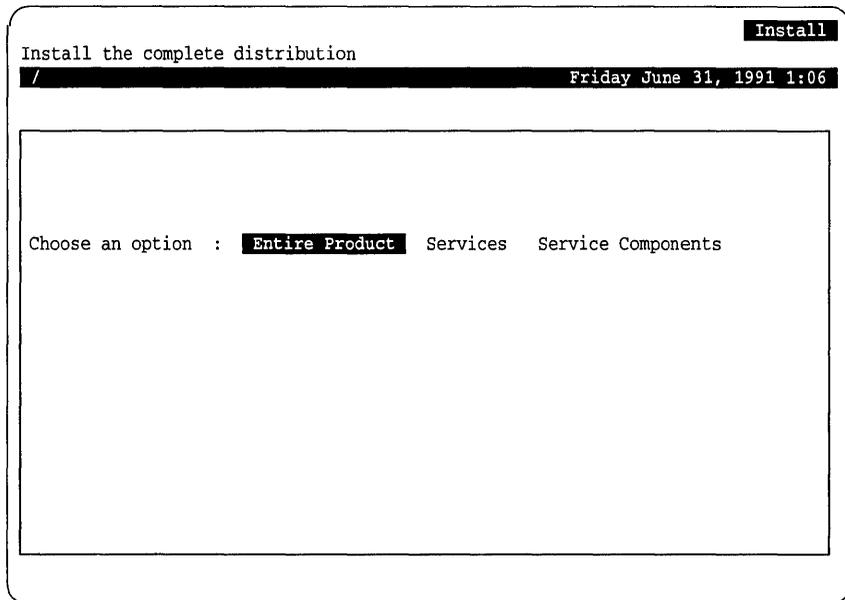
```
                                                          ┌─────────┐
                                                          │ Install │
                                                          └─────────┘
Install the complete distribution
 /                                          Friday June 31, 1991 1:06


    ┌──────────────────────────────────────────────────────────────┐
    │                                                                │
    │                                                                │
    │                                                                │
    │   Choose an option  :  ▌Entire Product▐   Services   Service Components
    │                                                                │
    │                                                                │
    │                                                                │
    │                                                                │
    │                                                                │
    │                                                                │
    │                                                                │
    │                                                                │
    └──────────────────────────────────────────────────────────────┘
```

Use the ⟨Left Arrow⟩ key to highlight Service Components and press ⟨Return⟩.

5. You see the next screen:

```
┌──────────────────────────────────────────────────────────────────────────┐
│                                                               ▐ Install ▌  │
│  Select service component(s) to install and press <Return>                 │
│  Press <Esc> to cancel, movement keys are active                           │
│ ▐/                                              Friday June 31, 1991 1:06 ▌ │
│   ┌──────────────────────────────────────────────────────────────────┐    │
│   │                                                                    │    │
│   │                                                                    │    │
│   │  Choose an option  :  Entire Product  Services   [ Service Components ] │
│   │                                                                    │    │
│   │                                                                    │    │
│   │                                                                    │    │
│   │                                                                    │    │
│   │                   ┌──── SCO UNIX System V Operating System ────┐   │    │
│   │                   │▐ SCO System V Runtime System             ▌ │   │    │
│   └───────────────────│ SCO System V Extended Utilities            │   │    │
│                       └────────────────────────────────────────────┘   │    │
│                                                                        │    │
└──────────────────────────────────────────────────────────────────────────┘
```
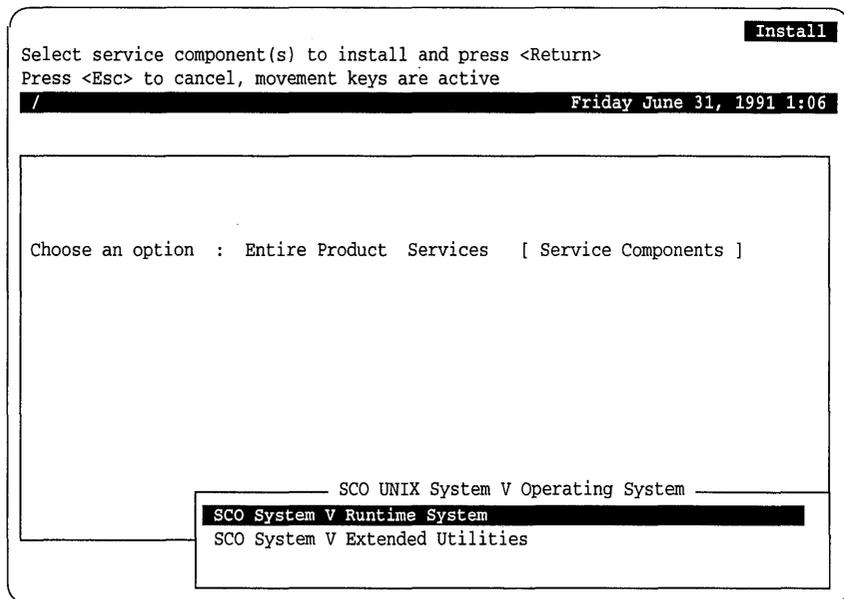
Use the ⟨Down Arrow⟩ key to select SCO System V Extended Utilities and press ⟨Return⟩.

6. You see this screen:

```
                                                           ┌─Install─┐
Install the entire product
Press <Esc> to cancel, movement keys are active
/                                            Friday June 31, 1991 1:06
┌──────────────────────────Install────────────────────────────┐
│                                                              │
│                                                              │
│                                                              │
│     Select a product   :     SCO UNIX System V Extended Utilities │
│                                                              │
│     Choose an option   :     ▓Entire Product▓   Packages   Files │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
└──────────────────────────────────────────────────────────────┘
```

The Entire Product option is highlighted. Use the ⟨Right Arrow⟩ key to highlight Packages and press ⟨Return⟩.

7. Next, data files are loaded and you see the list of operating system packages similar to the following:

```
                                                               ┌─────────┐
                                                               │ Install │
                                                               └─────────┘
Select package(s) from which to choose files and press <Esc>
Press <Esc> to return, movement keys are active
┌──────────────────────────────────────────────────────────────────────────┐
│ /                                               Friday June 31, 1991 1:06  │
└──────────────────────────────────────────────────────────────────────────┘
     ┌──────────────────────────────Install──────────────────────────────┐
     │                                                                    │
     │  Select a product    :     SCO UNIX System V Extended Utilities    │
     │                                                                    │
     │  Choose an option    :      Entire Product    [ Packages ]  Files  │
     │                                                                    │
     │       ┌───────────── SCO UNIX System V Extended Utilities ───────┐ │
     │       │  Name     Inst    Size    Description                    │ │
     │       │ ┌────────────────────────────────────────────────────┐  │ │
     │       │ │*ALL      Part   33738    Entire Extended Utilities   │  │ │
     │       │ └────────────────────────────────────────────────────┘  │ │
     │       │  AIO       No        46    Asynchronous raw I/O administration
     │       │  BACKUP    No       272    System backup and recovery tools
     │       │  BASE      Part    1088    Basic extended utility set    │ │
     │       │  CSH       No       120    The C-Shell                   │ │
     │       │  KSH       No       218    The K-Shell                   │ │
     │       │  DOS       No       378    DOS utilities                 │ │
     │       │  FILE      Part     318    File manipulation tools       │ │
     │       │  LAYERS    No       126    System V Layers               │ │
     │       └────────────────────────────────────────────────────────┘ │
     └────────────────────────────────────────────────────────────────────┘
```

You can move up and down the list using the arrow keys. If you wish to select several packages to install, use the (Space) bar to mark each one with an asterisk (*). When you press (Return), each item you have marked is installed. Note that you can add all available packages by selecting ALL.

Refer to "Packages in this set" in your *Release Notes* for a list of operating system packages.

8. You are then prompted to insert the necessary distribution volumes. When the packages are completely installed, you return to the main **custom** menu.

9. When you have finished installing UNIX system packages, exit **custom** by selecting Quit from the main **custom** menu and confirming your selection.

Removing software from the system

Generally, removing software from the system, whether in products, services or service components, or packages, follows the same procedure as installing them. You select Remove from the main **custom** menu and then select the software just as you did at installation time. Products that include special drivers relink the kernel and thus remove these drivers. Certain special procedures may apply to different products.

F

Appendix F

Using your additional filesystems

If your hard disk is 245 Mbytes or larger, the system can create a user file-system on your SCO UNIX System V/386 partition.

When you select to initialize the hard disk using the "Automatic" initialization option, the system automatically creates one for you. If you select the "Fully Configurable" option, and the size of the hard disk is greater than 245 Mbytes, the system allows you to create this filesystem.

If you created any additional filesystems or the system created one for you (such as /u) earlier in the installation, you must prepare them for use by following the instructions in this appendix.

1. Make the following **sysadmsh** selection:

    Filesystems ⇨ Add

2. You see the following:

```
Filesystem Initialization Program

This program performs maintenance tasks required to add or delete
an existing filesystem. Would you like to:

        1. Add a new filesystem to system.
        2. Remove a filesystem.

Select an option or enter q to quit:
```

Enter **1** and press ⟨Return⟩.

3. You are next prompted for the device name:

> ```
> Enter a device name and press <Return> or q to quit:
> ```

Enter the full pathname of the device from */dev*. For example, to add a filesystem called *x*, you enter **/dev/x**.

4. You are now prompted to provide the name of the mount point to be used (the pathname of where you want the filesystem to be added):

> ```
> Enter a directory name and press <Return> or q to quit:
> ```

This directory is where the filesystem is mounted. For example, a filesystem called *x* is mounted on the directory */x*.

5. The following is displayed:

> ```
> Reserving slots in lost+found directory ...
>
> When entering multiuser mode:
>          1. Always mount filesystem
>          2. Never mount filesystem
>          3. Prompt before mounting filesystem
>
> Select an option:
> ```

If you want the filesystem mounted automatically at system startup, enter **1**. If you want the filesystem mounted only at the request of the system administrator, select **2**. If you want the system to prompt you at startup as to whether or not the filesystem should be mounted, select **3**.

6. You are then asked whether or not you want to permit users to mount the filesystem:

> ```
> Do you want to allow users to mount this file system? (y/n)
> ```

You should respond **n** to restrict this action to only the system administrator.

7. The following messages are displayed when the process is complete.

> ```
> Updating system files ...
> Filesystem has been successfully added.
> ```

8. Next, you should mount the /u filesystem using the following **sysadmsh** selection:

Filesystems ➪ Mount

The new filesystem is now ready for use.

Appendix G
Creating an emergency boot
floppy set

The Emergency Boot Floppy Set is an important tool used in administering your system. It may allow you to recover your system in the event of a catastrophic system failure, where the computer does not respond when you attempt to start it. You can use these diskettes to restore a corrupted *root* filesystem without reinstalling the operating system. If you have more than one system, you should make one Emergency Boot Floppy Set for each machine. Each machine requires a unique emergency set. A set made on one system may not work with any other system. Be sure to keep these sets of diskettes separate; if you use an emergency floppy set on the wrong machine, it may not work and further corruption may result.

The program used to create the Emergency Boot Floppy Set is called **mkdev fd** and is invoked by **sysadmsh**(ADM). It is a menu-driven program that can create three types of disks: simple filesystem (described in "Using floppy disks and tape drives" in the *System Administrator's Guide*) and the two used in the Emergency Boot Floppy Set, bootable-only and one *root* filesystem only. You must create one bootable and one *root* filesystem disk to make up your set. The formats supported are: 48 tpi, 96 tpi-15 sectors per track in the 5¼ inch format, and 135 tpi-9 sectors per track and 135 tpi-18 sectors per track in the 3½ inch format.

Creating the floppies

To create your set of floppies, follow this procedure:

1. Use the following **sysadmsh** selection:

    Filesystems ➪ Floppy

2. You see the following display:

    ```
    Floppy Disk Filesystem Creation Program

          Choices for type of floppy filesystem.

          1. 48tpi, double sided, 9 sectors per track
          2. 96tpi, double sided, 15 sectors per track
          3. 135tpi, double sided, 9 sectors per track
          4. 135tpi, double sided, 18 sectors per track

    Enter an option or q to quit:
    ```

    Enter the number representing the disk type desired and press ⟨Return⟩.

3. Next you see:

    ```
    Choices for contents of floppy filesystem.

    1. Filesystem
    2. Bootable only          (96ds15 and 135ds18 only)
    3. Root filesystem only   (96ds15 and 135ds18 only)

    Enter an option or enter q to quit:
    ```

    Create the bootable disk first; enter **2** and press ⟨Return⟩.

4. You see the following prompt:

    ```
    Insert a type floppy into drive 0.
    Press <Return> to continue or enter q to quit:
    ```

    Press ⟨Return⟩. *type* is replaced by the selected floppy type.

5. The following prompt is displayed:

```
Would you like to format the floppy first? (y/n)
```

If you have already formatted the floppy, enter **n** and the filesystem is immediately created. If the floppy has not yet been formatted, enter **y** and you see:

```
formatting /dev/type
track 00 head 0
```

The track and head numbers count up as the floppy is formatted. (If */etc/default/format* contains VERIFY=Y, the format is also verified after formatting.)

6. The following is displayed:

```
Successfully created filesystem.

Copying files to /dev/type ...
```

The bootable disk is then generated by creating a filesystem and copying the relevant files from the *root* filesystem. **mkdev fd** (see **mkdev**(ADM)) also checks the filesystem with **fsck**(ADM); messages similar to the filesystem check displayed at boot time are displayed.

7. The following message is displayed when the disk is ready:

```
type floppy created and checked successfully
```

Remove the floppy from the drive, label it "Boot" and include the machine name, and put a write-protect tab on it so that you do not accidentally erase the information on the disk.

8. You are then returned to the main menu. You should now create the *root* filesystem diskette. Enter **3** and press ⟨Return⟩.

9. You see the following prompt:

```
Insert a type floppy into drive 0.
Press <Return> to continue or enter q to quit:
```

Press ⟨Return⟩.

10. The following prompt is displayed:

```
Would you like to format the floppy first? (y/n)
```

If you have already formatted the floppy, enter **n** and the filesystem is immediately created. If the floppy has not yet been formatted, enter **y** and you see the formatting messages described earlier.

11. The following messages are displayed:

```
Copying files to /dev/type root filesystem ...

Copying special files to /dev/type root filesystem ...
```

12. As with the bootable floppy, **mkdev fd** checks the filesystem with **fsck**(ADM); similar messages are displayed.

13. The following message is displayed when the disk is ready:

```
type floppy created and checked successfully
```

14. You see this menu again:

```
Choices for contents of floppy filesystem.

1. Filesystem
2. Bootable only          (96ds15 and 135ds18 only)
3. Root filesystem only   (96ds15 and 135ds18 only)

Enter an option or enter q to quit:
```

To exit **mkdev fd**, select **q** and press any key at the prompt.

15. You return to **sysadmsh**. Press ⟨F2⟩ to return to the main menu, then select Yes to exit **sysadmsh**.

16. If you want to use **tar**(C) to restore backups when you boot from your Emergency Boot Floppy Set, continue with the next step. If you plan to use **cpio**(C) only from your floppy set, skip to step 20. The *root* filesystem disk that you created already contains the **cpio** utility.

17. To put the **tar** utility on your *root* floppy disk, first mount the *root* floppy filesystem:

mount /dev/fd0xx /mnt

Here *xx* is either **96** (15 sectors per track) or **135** (18 sectors per track).

18. Copy **tar** and the */etc/default/tar* file to the floppy filesystem:

    cp /usr/bin/tar /mnt/bin

    cp /etc/default/tar /mnt/etc/default

19. Unmount the *root* floppy filesystem:

    umount /mnt

20. Remove the floppy from the drive, label it "Root" and include the machine name, and put a write-protect tab on it so that you do not accidentally erase the information on the disk.

You now have two disks: a boot floppy (Boot) and a *root* filesystem floppy (Root). Store these diskettes in a safe and secure place. Make sure that they are easily accessible; you will need them if your system becomes corrupted and is no longer bootable.

G

Appendix H

Backing up and restoring your system

This appendix describes how to copy your system files to floppy disks or tape, and in the event of a system failure, restore them. You should perform a complete backup at least once a week to preserve your files in case of a system failure. If you do not make backups on a regular basis, you can lose your files.

If you have created additional filesystems (for example, */u*), you can back them up separately. For more information, see the "Backing Up Filesystems" chapter in your *System Administrator's Guide* in this documentation set.

Creating backups

To create a backup, follow these steps:

1. Invoke **sysadmsh** and select the following:

    Backups ⇨ Create ⇨ Unscheduled

2. When the Archive Filesystem form is displayed, select the filesystem to archive by pressing ⟨F3⟩ to display a point-and-pick list of the available filesystems. Select */dev/root* from the list by moving the highlight using the arrow keys and pressing ⟨Return⟩.

    You can specify other individual filesystems to back up.

3. Next, select the media device to use by entering the name or by pressing ⟨F3⟩ to display a list.

> **NOTE** Take care when selecting the number of the media device. For example, make certain that you do not select "drive (1)" (the secondary floppy drive) when you want "drive (0)" (the primary floppy drive). If you make this error, the backup is aborted and you must start the procedure again.

The block and volume sizes are selected automatically.

4. You can format as many volumes as you wish by inserting each volume one at a time into the drive and selecting Yes on the "Format a floppy" field.

> **NOTE** Mini-cartridge tapes can also be formatted, but this is not recommended. Best results are achieved with preformatted cartridges.

5. Load a volume (tape or disk) into the selected drive, close the drive door, and press ⟨Return⟩ on the Archive option. The filenames are displayed as they are backed up.

6. If a volume runs out of space, you are prompted to insert another volume. The backup utility continues to copy files to the new volume. Repeat this step until the program indicates the backup is finished.

If you are using floppies, you may need to repeat the last step several times before the backup is complete. Label each volume as you remove it from the drive. It is recommended you label each with the following information:

- machine name (if multiple machines at site)
- volume number
- backup date
- filesystem name, if applicable (that is, if more than one)
- backup technique

For example:

    r5omino
    volume 1
    10/10/91
    /dev/root
    unscheduled backup with sysadmsh

Restoring individual files or directories from backups

You can restore individual files or directories from your filesystem backup volumes using **sysadmsh**. You need the complete set of backup volumes containing the latest version of the file or files you wish to restore. If you are restoring a file that was not changed recently, use the last level 0 backup. For more information on level backups, see the "Backing up filesystems" chapter in your *System Administrator's Guide* in this documentation set.

To restore a file, follow these steps:

1. Invoke **sysadmsh** and select the following:

    Backups ⇨ Restore ⇨ Partial

2. Press ⟨F3⟩ to display a point-and-pick list of media devices.

    > **NOTE** Take care when selecting the number of the media device. For example, make certain that you do not select "drive (1)" (the secondary floppy drive) when you want "drive (0)" (the primary floppy drive). If you make this error, the restore is aborted and you must start the procedure again.

    A window pops up to confirm the drive is ready.

3. Insert volume 1 of the backup set into the drive. You return to the Restore File form.

4. Enter the name of the file to restore.

5. Enter the directory that you wish to restore the file(s) to.

    When providing this information, be aware of two important points:

    - When specifying the pathname, you must remove the leading slash (/) character. For example, if you are restoring the file */bin/foo*, specify it like this:

        bin/foo

    - If you enter the pathname of the original location for the file, the restored files overwrite any files by the same name in that location. Verify that the files on the backup volume are the desired versions of these files.

        If you are not absolutely sure that your backup contains the preferred version of the files, restore them to a temporary location, such as */tmp*, and compare them with your current files on disk using **diff**(C) or **cmp**(C) before moving them to their original locations.

To restore files to a temporary location, you must exit **sysadmsh**. At the system prompt, enter the following commands:

cd /tmp
cpio -iucdrB -I /dev/xxx bin/foo

Here *xxx* is the tape or floppy device. For example, to restore */bin/foo* from a backup on a standard cartridge tape device, enter:

cpio -iucdrB -I /dev/rct0 bin/foo

The block size is selected automatically.

6. The **restore** utility searches the archive for the specified files. Each filename is displayed after it is restored to the specified locations on your hard disk. If necessary, you are prompted to switch volumes.

7. Once you know that all the files that you specified have been restored, you can exit the **restore** utility using the ⟨Del⟩ key. (If you do not press ⟨Del⟩, the **restore** utility continues to search to the end of the backup.)

Restoring an entire filesystem

Follow these steps to restore your filesystem backup:

1. Insert the first volume, and make the following **sysadmsh** selection:

    Backups ➪ Restore ➪ Full

2. When the form is displayed, enter the name of the filesystem, or press ⟨F3⟩ for a point-and-pick list of available filesystems.

3. Select the media device. The block size is selected automatically.

4. Press ⟨Return⟩ on the Restore option. You see a confirmation prompt; enter **y**.

5. As each file is restored, the name is printed on the screen. If your backup has multiple volumes, you are prompted to insert each in turn. When the restoration process is complete, the number of blocks restored is displayed.

Appendix I

Troubleshooting

During the installation procedure, do not assume that you know what is about to happen, even if you have installed the system before. Read the installation documentation closely.

Sometimes errors occur during the installation procedure. Errors can happen as you install the software, or they can cause problems when you boot immediately after installation. If you have difficulty installing the software, this appendix describes the most common problems, how to avoid them, and how to fix them if they happen.

If you do not find your problem described in the sections that follow, use the section on "Solving undocumented problems" to try and identify your problem. If your system hangs mysteriously, this section can help eliminate some of the more common difficulties. (Additional troubleshooting information is also found in the "Troubleshooting your system" chapter of the *System Administrator's Guide*.)

If you cannot solve your problem and you must contact your supplier for help, be sure to record your system information as described in "Before calling for help" at the end of this appendix.

Solving problems during installation

This section covers some common problems that you may have while installing the software.

System does not boot from the N1 (Boot) floppy disk

If the system does not boot from the Boot floppy disk as described at the beginning of the installation procedure, you should do the following:

1. Verify that the N1 (Boot) floppy disk is in the drive and that the door to the floppy disk drive is completely closed. If another floppy disk is in the drive, the system does not display an error message; the system simply does not boot.

2. If the Boot floppy disk still does not boot, verify that your floppy disk drive works by booting a DOS disk.

3. If the floppy disk drive does not work, you may have damaged your Boot floppy disk. If this is the case, and you do not have a backup copy, call your supplier to arrange for a replacement Boot floppy disk.

Error reading a floppy disk

If an error occurs while reading a floppy disk, you should do the following:

1. Verify that the correct disk is in the floppy disk drive.

2. Make sure that the floppy disk is inserted correctly. (See your owner's manual if you do not know how to insert the floppy disk correctly.)

3. Verify that the door to the floppy disk drive is completely closed after you insert the floppy disk.

4. If the error message persists, call your supplier to get a replacement.

System reboots from N1 or screen blanks after boot prompt

If you cannot install because the system keeps rebooting from the N1 floppy disk or the screen blanks after pressing ⟨Return⟩ at the Boot prompt, one of two known situations may be causing this problem:

- an improperly configured EGA adapter

- an incompatible VGA adapter

If you have an EGA or VGA adapter, you should do the following:

- Verify that the adapter is supported. Check the "Compatible hardware" appendix in the *Release Notes*.

- Make sure that the switches on the adapter are set correctly and boot in the relevant mode for your machine.

If the card has an **AUTOSWITCH** reboot feature, the system can also hang during the booting process.

This feature must be disabled to install the UNIX system. The documentation included with your graphics card should indicate how to disable **AUTOSWITCH**. This is typically controlled by setting a small switch on the card to the off position. You can then restart the installation from the beginning. If the problem persists, contact your supplier for support.

Another symptom of this **AUTOSWITCH** problem is observed when the boot prompt is displayed:

```
Boot
:
```

If you are using an **AUTOSWITCH** EGA card that normally displays in high resolution (EGA or VGA mode) and this prompt is displayed in low resolution (CGA mode), reset the machine until the high resolution display appears. (Standard CGA text is low resolution; dark lines are visible through the characters. EGA and VGA text is high resolution; no dark lines are visible.)

System does not boot from the hard disk

If the system does not boot from the hard disk as described near the end of the installation procedure, you may see a message similar to this:

```
PANIC: iinit
```

If you have an ST506 or ESDI disk and you did not run a bad track scan during installation and the boot block was written on a bad track, the system does not boot from the hard disk. (If you selected the Automatic Initialization to initialize your hard disk automatically, your disk was scanned for bad tracks.)

Whatever the reason for this problem, you must reinstall your UNIX system.

If the operating system still does not boot, run the hardware diagnostics that came with your computer and hard disk.

Solving problems after installation

This section describes some problems that you may encounter when you boot the system immediately after installing the software.

Hardware does not work under the UNIX system

If some hardware (for example, a tape drive) does not seem to work with the UNIX system installed, although it works correctly under another operating system, the hardware may not be supported by the UNIX system or it may also need to be configured into the system (for example, **mkdev tape**).

Refer to the "Compatible hardware" section in the *Release Notes* for information on the hardware that you can use with the UNIX system.

UNIX system and DOS do not work

If you install the UNIX system after installing DOS, and both operating systems do not work, you need to back up your DOS files and reinstall both systems. You should make certain that you followed the guidelines found under "Creating and formatting a physical DOS partition" in Appendix A of this guide and also see the **dos**(C) manual pages in the *User's Reference* in this documentation set.

Problems booting on a disk with greater than 1024 cylinders

If your hard disk has more than 1024 cylinders and your system hangs mysteriously or displays one of the following error messages at boot time, the problem may be that the boot information lies beyond the 1024 cylinder boundary:

```
bn void number

/boot not found

unix not found

Bad magic number
```

If this happens, you must reinstall your UNIX system, run the manual hard disk initialization, and rearrange your filesystems so that the *root* filesystem is located within the first 1024 cylinders.

Since this limitation is expressed in cylinders and UNIX **fdisk**(ADM) uses tracks, you should determine the number of tracks per cylinder for your disk. To do this, follow the instructions in "Converting fdisk numbers" in Appendix A of this guide.

Common system resource error messages

When system limits are exceeded, the operating system displays warning messages on the console. Some of the messages are advisory only. Others precede a system panic: the system displays some additional diagnostic messages and then "hangs," requiring you to reboot.

You can expand these limits by reconfiguring values known as *tunable kernel parameters*. The kernel should not be reconfigured simply because a system resource error message was received once, or even a couple of times, but only when a single message persists between system sessions.

Table I-1 Error messages and associated tunable parameters

Error message	Parameter	Category
iget - inode table overflow	**NINODE**	3
Timeout table overflow	**NCALL**	5
File table overflow	**NFILE**	3
No more processes (system-wide)	**NPROC**	4
No more processes (per-user)	**MAXUP**	4
Region table overflow	**NREGION**	4
Too many open files	**NOFILES**	3
out of queues	**NQUEUE**	11
out of streams	**NSTREAM**	11

If you encounter any of the messages listed in Table I.1, note the name of the parameter and the category number. Read the instructions found in "Reallocating kernel resources with configure" in the "Tuning system performance" chapter of the *System Administrator's Guide*. If you need to adjust a resource, first try to increase the value by a small amount. If the problem persists, increase it up to the limit of the **mtune** value. If the problem is still not solved, more detailed research is required to locate the exact program and sequence that cause the error.

Solving undocumented problems

If your problem is not described in this appendix or in "Troubleshooting your system" in the *System Administrator's Guide*, this section can help you to isolate, identify, and solve the problem.

Hardware under the UNIX system and DOS

The fact that a given piece of hardware works under DOS is no guarantee that it will work with the UNIX system. A critical difference between the UNIX system and DOS is the way in which they access hardware. One way in which DOS or an application under DOS can read or write information to a device controller (disk controller, tape controller, serial/parallel and so on). is to make a call to the BIOS (Basic Input/Output Services), which then takes the data and reads/or writes it to the appropriate device. Except for very short periods of time during the boot process, the UNIX system never uses the BIOS.

DOS or an application makes a device-independent call to the BIOS to transfer data. The BIOS takes this device-independent call and translates it into a device-dependent set of instructions to transfer data to or from a particular device. Under the UNIX system, device drivers handle many of the functions for which DOS can use the BIOS.

Some clone manufacturers depend on something called BIOS compatibility. DOS functions can be, in a sense, device-dependent, because some of the device-dependent functions of DOS have been separated out into the BIOS. This means that manufacturers can make their non-standard devices work under DOS by modifying the hardware BIOS that acts as the interface between the hardware and DOS.

By writing code that reads/writes directly to the device, DOS can also use devices without going through the BIOS. The ability to write directly to a device is one reason why some hardware works under DOS, but not under the UNIX system. Since the UNIX system does not make use of the BIOS, it expects a piece of hardware to be at a specific interrupt, DMA channel, and base address, and only recognizes the hardware if it is configured properly.

Identifying your problem

If the system hangs mysteriously, whether at boot time, during installation, or shortly thereafter, use the steps below to isolate and identify the problem:

1. Confirm that your hardware is listed as "supported" in the *Release Notes*. If not, we recommend that you contact your technical support.

2. If possible, see if a suspect component works on another machine with the same configuration (under the UNIX system, not DOS).

3. If any third-party drivers are installed, such as those supplied with multiport cards, remove them, relink the kernel, and see if the problem persists.

4. Make certain that your devices are recognized at bootup. Watch the boot display, check */usr/adm/messages*, or use the **hwconfig**(C) utility.

5. Check for hardware conflicts between components, including DMA, interrupts, and memory addresses. The information displayed by **hwconfig** or found in *usr/adm/messages* can be useful in locating a conflict. The system displays a message screen similar to the following. This sample display is from *usr/adm/messages*. This display shows no conflicts in the address, vector, or dma columns. The display for your machine may indicate a conflict. Although this display is useful, the hardware settings should be double-checked to make certain they are in agreement. Be certain you have checked for documented incompatibilities or limitations in Appendix A of your *Release Notes*.

```
device     address        vector dma comment
------------------------------------------------------------------------
%serial    0x03F8-0x03FF 04     -   unit=0 type=Standard nports=1
%serial    0x02F8-0x02FF 03     -   unit=1 type=Standard nports=1
%floppy    0x03F2-0x03F7 06     2   unit=0 type=96ds15
%console   -             -      -   unit=ega type=0 12 screens=68k
%parallel  0x0378-0x037A 07     -   unit=0
%tape      0x0338-0x033C 05     1   type=W
%disk      0x01F0-0x01F7 16     -   type=W0 unit=0 cyls=286 hds=16 secs=63
```

6. If your machine has features such as shadow RAM or memory caching, disable them. These features can have unpredictable results. If you have a caching controller, for example, you can try disabling the caching until after the UNIX system is installed.

7. If you have a DOS partition installed, be sure it follows the the guidelines found under "Creating and formatting a physical DOS partition" in Appendix A of this guide.

8. If your hard disk has more than 1024 cylinders, it must observe the restrictions found under "Installing on disks with greater than 1024 cylinders" in Chapter 1 of this guide. See "Problems booting on a disk with greater than 1024 cylinders" in this appendix for more information.

9. If you have a QIC-40 or QIC-80 mini-cartridge tape drive installed, the system can fail unpredictably if it is not installed correctly. Check the following:

   • The tape device must not be configured as the third device on the controller. (This is not supported under the UNIX system as it is under DOS.) You should always configure the drive as the second device, unless you have a four-device controller, where it can be the fourth device.

   • The jumpers on the drive must be configured properly.

   • You must use your computer's setup program to indicate there is no floppy disk device attached in place of the tape drive.

10. If your video card is incorrectly installed, the system can also fail unpredictably. Check the following:

   • Read the section "System reboots from N1 or screen blanks after boot:" under "Solving problems during installation" earlier in this appendix.

   • Known conflicts exist between video cards and network cards. Attempts to send or receive data from the network card can be blocked. This problem can be resolved if you avoid using IRQ2 (interrupt vector 2) for your network card. Some graphics cards use the additional interrupt, causing the conflict to occur. Check Appendix A of your *Release Notes* for warnings that apply to specific cards and card combinations.

   • Known conflicts exist between certain 16-BIT VGA boards and floppy disk or tape data transfer. We recommend that you put your 16-bit boards into 8-bit slots. Consult your hardware documentation for more information.

11. If you did a low-level format of your hard disk with a third-party format program, you may have a corrupt disk. Format programs that are known to work are DOS **Debug** and **Speedstor** and others.

Before calling for help

If your problem is not discussed in the troubleshooting information in this chapter or "Troubleshooting Your System" in the *System Administrator's Guide*, and you cannot isolate the problem using "Solving undocumented problems," you can call your supplier for help. Before doing this, you should enter critical information in the tables included in this section so that your problem can be analyzed and dealt with quickly. This includes a description of your problem and your system configuration.

A description of the problem

You should write down a complete description of your problem, including the precise series of commands or steps taken that lead to the problem. Include any error messages displayed; write each error message down exactly as it appears, complete with any punctuation and uppercase characters.

System configuration

Knowing the hardware and software configuration of your system is vital to a correct diagnosis of your problem. The process is greatly accelerated if this information is available when speaking to your supplier. List *all* the hardware components, including their brand names and model numbers. You should also list all applications and third-party device drivers you have installed.

Problem description: (include steps to duplicate problem and error messages, if applicable)

Hardware configuration: Component	Brand name	Model
Computer		
Monitor		
Processor type		
Processor speed		
Coprocessor		
Memory size		
Floppy drive(s)		
Video card		
Hard disk(s)		
Controller or host adapter		
Tape drive/controller		
Network adapter		
Mouse		
Serial card		
Printer		
Modem		
Other device		
Other device		
Other device		
Other device		

Software configuration: applications and/or driver	
Product name	Release number

Appendix J
Installation messages

This appendix contains messages that may appear on your screen while installing your SCO UNIX System V/386 Operating System.

Listed here are the messages as displayed on the screen, the possible causes of the installation messages and any actions that you may take to correct the errors.

script in the list represents the actual pathname of the failed program.

1. The **script** installation program has failed.
    Contact your Support Representative if you require assistance.
    Installation aborted.

    Cause Due to presently unknown reason the specified installation program failed.

    Action Contact your technical support representative quoting the failed *script*.

2. The **script** installation has been interrupted.
    Installation aborted.

    Cause Pressing the ⟨Del⟩ or **q** keys.

    Action Follow the instructions given after the prompt.

3. The *script* installation program has exited with an
   unknown status. Installation aborted.

   Cause The installation is aborted because the program being executed
   has exited without a recognizable exit status: for example, fail,
   succeeded and so forth.

   Action Contact your technical support representative.

4. Error: incorrect floppy in drive.

   Cause Using a floppy disk other than the N1 (Boot) floppy disk in the
   drive.

   Action System prompts you to insert N1, press ⟨**Return**⟩ to continue.

5. Error: Cannot mount the N1 (Boot) floppy.

   Cause Either the N1 (Boot) floppy disk is corrupt and the system does
   not recognize the contents of N1 as being a boot filesystem or
   the mount operation has failed.

   Action Obtain another N1 (Boot) floppy disk from your technical
   support representative.

6. /etc/custom: interrupted
   Use /etc/custom to install any further software on the system.

   Cause Pressing the ⟨Del⟩ key within **custom**(ADM) utility.

   Action Though **custom**(ADM) has aborted installing the selected pack-
   ages, the installation process is still running and the message
   above implies that you should finish installing the operating
   system and then use **/etc/custom** to reinstall these packages.

7. Custom installation of Operating System packages failed.
   Contact your Support Representative if you require
   help in further installation of software.

   Cause **custom**(ADM) experiencing problems during installation of cus-
   tom packages. Probably corrupt medium causing an extraction
   error. This may also be due to incorrect definitions from within
   other installation scripts or errors from the **custom**(ADM) utility.

   Action Complete the normal operating system (OS) installation, try
   installing the same package again using **/etc/custom**. If the prob-
   lem persists, then contact your technical support representative.

8. `Sorry, that volume does not contain` ***pkg1*** `package.`

   Cause   Incorrect floppy disk volume inserted for the required boot-time loadable drivers (BTLD) package. *pkg1* is the actual BTLD package name.

   Action   Insert the appropriate volume. For more information, refer to your boot-time loadable driver (BTLD) documentation supplied by the third-party manufacturer.

9. `Cannot perform an update, only release 3.2v2 systems`
   `can be updated. Installation aborting ...`

   Cause   Attempting to update a system other than SCO UNIX System V/386 Release 3.2 Operating System Version 2.0.

   Action   After the termination process, use the "Fresh" installation option to install your software (version 4.0) system. It is advised that you perform a backup of any special configurations on the system before proceeding with this installation option.

10. `Cannot perform an update; problems with the root`
    `filesystem on the hard disk.  Installation aborting ...`

    Cause   The *root* filesystem on your hard disk is corrupt.

    Action   Use **fsck**(ADM) with the **-b** option to clean the *root* filesystem and try again. For more information, see the section, "About the update," in Chapter 3, "Running the update installation," in this *Installation Guide*.

11. `Error: Invalid activation key`

    Cause   Using the wrong serial number or activation key.

    Action   Follow the screen prompts and try again.

12. `Error:` ***file*** `is already serialized.`

    Cause   The specified *file* is currently serialized and can not be serialized again. *file* here is replaced by the subject file.

    Action   Answer **n** to try again when prompted by the system.

13. ```
    Cannot serialize serfiles.  Contact your Support Representative
    immediately.  Exiting ...
    ```

    Cause   The system attempted to serialize the specified *serfiles* and failed. **custom**(ADM) is executing this serialization process. *serfiles* is replaced by the actual filenames.

    Action   Contact your technical support representative.

14. ```
    Extraction of Master Installation floppy failed.  Do you want
    to try again?
    ```

    Cause   The installation failed to copy the contents of the M1 (Master) floppy disk onto the hard disk.

    Action   Try again, and if unsuccessful, then contact your technical support representative for a replacement M1 floppy disk.

15. ```
    Error: Cannot find the right message files.
    ```

    Cause   The system messages for a specific script are listed in a message file which can not be located.

    Action   Follow the information given on the screen to continue.

16. ```
    Cannot mount the hard disk root filesystem.
    This installation cannot proceed until this is possible.
    Contact your Support Representative immediately.
    Exiting ...
    ```

    Cause   The *root* filesystem may be corrupt, or the mount process does not recognize the type of filesystem, or the hard disk may be inaccessible.

    Action   Call your technical support representative.

17. ```
    The new packages require diskspace MBytes of free disk space.
    You only have  diskspace  MBytes  free,  and  cannot  therefore
    install
    the new packages.
    Enter 'c' to continue by updating only the packages
    on the previous system, or 'q' to quit the update (c/q):
    ```

    Cause   The current free disk space on your hard disk is not sufficient to install all the the new packages in this release of the operating system.

    Action   Select c to continue the update of packages on the previous system to the new release. On completion of the installation process, invoke **custom**(ADM) to selectively install packages new to this release.

Installation kernel self-check letters

During the installation procedure, **boot**(HW) is used to start up the kernel. Each time the kernel is started, the system performs a self-check on the hardware detected. The SCO UNIX System V/386 distribution contains drivers for all the hardware the system expects to find on your system.

At each stage of the self-check, a letter (plus an optional number if the stage is subdivided into more checks) is displayed by one of the drivers in the installation kernel. These letters are displayed in succession. The process normally pauses for a while at certain letters. However, if the process stops at a particular letter, and does not continue, there is a problem with the initialization of the respective driver.

Below is a list of the meanings of the kernel startup letters for the SCO UNIX System V/386 Release 3.2 Operating System Version 4.0 installation kernel.

D   Checks for 10 bits of I/O decoding by writing to and reading from the direct memory access (DMA) controller channel 0 page table address register (I/O port 0x87).

Performs Original Equipment Manufacturer (OEM) specific initializations. If the initialization stops here, it is a hardware problem and may be resolved by running hardware tests which are available on reference or setup diskettes from the hardware manufacturers.

E   Prints configuration information for the numeric coprocessor, if present (80287, 80387, or Weitek).

This checks for the type of floating point processor present, if any. If present, confirms that the coprocessor is properly connected and that your hardware recognizes it. Refer to your floating point processor documentation for available tests. Also performs multiprocessor initialization.

F   This initializes I/O devices by calling system initialization functions for all the hardware detected.

If a failure occurs at this stage, check the relevant devices for incorrectly configured or non-functioning errors. Refer to the documentation for the relevant hardware for more information.

Boot Letter	Description
F0	pre-driver initialization
F1	auditing
F2	Corollary SCSI host adapter
F3	itimers
F4	NMI handler
F5	serial chip
F6	CMOS database
F7	floppy disk driver
F8	error driver (logging device)
F9	string device driver
F10	console driver
F11	parallel port driver
F12	tape driver (cartridge)
F13	Adaptec SCSI host adapter (154x)
F14	Future Domain 1680, 700 (1800 chip) SCSI host adapter (primary init)
F15	SCSI disk subsystem
F16	SCSI tape subsystem
F17	SCSI CD-ROM subsystem
F18	Corollary SCSI host adapter
F19	Future Domain TMC800 series SCSI host adapter
F20	Distributed Processing Technology SCSI host adapter
F21	Storage Plus SCSI host adapter (Sumo)
F22	Olivetti SCSI host adapter (ESC-1)
F23	EISA Adaptec 174x SCSI host adapter
F24	Adaptec 152x SCSI host adapter
F25	Western Digital WD7000 SCSI host adapter
F26	Western Digital 1010 disk driver
F27	IBM SCSI host adapter
F28	Compaq SCSI tape host adapter (primary init)
F29	EISA CMOS driver
F30	Compaq Intelligent Drive Array controller
F31	SCSI disk subsystem (secondary)
F32	SCSI tape subsystem (secondary)
F33	SCSI CD-ROM subsystem (secondary)

Adding a device driver to the system may change the order or number of the initialization routines. Enter **/etc/conf/cf.d/initorder** to display a list of the initialization order for your configured system.

G   Initializes the PIC (Programmable Interrupt Controllers) chips and multiprocessors.

H   This initializes the various system resources. The numbers and their associated functions are:

Boot Letter	Description
H0	OEM-specific features
H1	c-lists
H2	buffer pool
H3	inodes
H4	filesystems
H5	file table
H6	opens root device, loads superblock into memory and mounts the root filesystem. If the root device is a hard disk, a configuration message will be displayed. A hang here indicates a damaged, missing or incorrectly configured root device.
H7	file locking
H8	IPC semaphores
H9	IPC messages
H10	streams
H11	Xenix shared data
H12	Xenix semaphores

I   Prints any OEM information, total kernel memory and user memory and some secondary initializations. The numbers and their associated functions are:

Boot Letter	Description
I0	OEM copyright information
I1	Future Domain 1680, 700 (1800 chip) SCSI host adapter (secondary init)
I2	Future Domain TMC800 series SCSI host adapter (secondary init)
I3	Compaq SCSI tape adapter (secondary init)

J   Initializes floating point emulator.

K   This opens up the swap device.

L   Adds the swap device to the swap file table.

M   Prints information on root, swap, pipe, dump devices, and kernel I/O buffers, and so forth. This also includes information on HZ and multiprocessor enabling.

Glossary

If you are relatively new to UNIX systems and/or to operating systems in general, the following descriptions of terms used in this guide should be helpful to you.

backup

Backups are copies of files from the hard disk that are saved on floppy disks or tapes in case of data loss.

bad track

A bad track is a small section of the hard disk that has lost its ability to store data. See also **track**.

bad track table

This table lists known bad tracks on the hard disk. It also contains space for tracks that may become bad in the future. Accesses to known bad tracks are redirected to the good tracks.

badtrk

badtrk is a UNIX system utility that scans a hard disk and records bad tracks.

BIOS

BIOS stands for Basic Input/Output Services. This software and associated data tables are usually stored in ROM on the main circuit board (motherboard) of the computer. The BIOS is used by the UNIX system only during the "boot" process.

bit

A bit is a binary digit; a "0" or a "1". In the binary system, there are no other digits.

block

block refers to different quantities depending on the context. For the operating system and the utilities used to divide the hard disk (as discussed in **divvy**(ADM), for instance), a block is 1024 bytes (1 Kbyte); for most utilities and in discussion of disk space usage, a block is 512 bytes (as used by the **custom** utility).

boot

boot means to begin the startup process. The common expression is "boot the system."

boot floppy

The boot floppy is a floppy disk containing the kernel that "boots" the system from the floppy drive.

bootstrap

The bootstrap is the program that loads the kernel into memory.

byte

A byte is a group of 8 bits. It is the basic unit of information. A single byte can describe a character such as "a" or "5" or "#". For instance, in the ASCII character set (see **ascii**(M)), the character "A" is represented by a byte containing the bits 0100 0001, which is the number 65 in decimal.

custom

custom is a program that installs products and optional packages of the operating system.

cylinder

Cylinder refers to the same track on each of the platters in a hard disk. For example, if a hard disk has five platters, the first cylinder consists of track one on each of the five platters.

device driver

A device driver is a program that allows the kernel to communicate with a particular device. Certain drivers, such as the floppy and hard disk driver, are already built into the kernel. Others must be attached or "linked" into the kernel using the Link Kit.

divvy

divvy is a program that divides a partition into separate filesystems.

dkinit

dkinit is a program that enables the UNIX system to recognize a hard disk that is not addressed by the ROM BIOS.

driver

See **device driver**.

fdisk

fdisk is the program that divides a disk into partitions, or different sections of the disk that will be occupied by different operating systems.

filesystem

A filesystem is a subdivision of a partition that is separate from the area where the operating system and utilities are located. This filesystem can be mounted and unmounted, just like a floppy disk or other device. See also **root filesystem**.

flaw map

A flaw map lists known bad tracks provided by the manufacturer.

fsck

fsck is the program that checks and cleans a filesystem after a system crash, reconciling various system tables and lists to what is actually on the hard disk.

gigabyte

A gigabyte is one K of megabytes and is abbreviated "G". In other words, 1024 X 1024 X 1024 bytes or 1024 X 1,048,576 bytes or 1,073,741,824 bytes or 2 to the 30th power. This is a huge amount of information. You can create and use files of up to 4 Gbytes, although other factors may impose a lower limit of 1 or 2 Gbytes. You may also have a gigabyte or more of storage on your hard disk.

hang

See **system hang**.

hard disk

A hard disk is a series of disks, or platters, that are scanned by a series of heads like those used on a tape recorder.

initialization

Initialization is the act of assigning initial values to variables before start of a computation.

kernel

The kernel is the center of the operating system, a program that is always in memory and underlies all programs, applications, and utilities that run on top of it.

kilobyte

A kilobyte is also known as "K" (for kilo), which means 1000. One K is 1024 bytes. The reason a K is not just "1000" is because 2 to the 10th power is 1024, and in the binary computer world, everything is based on powers of 2 instead of powers of 10.

Link Kit

Link Kit is a set of programs used to "link" or connect a device driver to the UNIX system kernel. See also **device driver**.

megabyte

A megabyte is sometimes abbreviated "meg" or "M" or "Mbyte". One megabyte is one K of Kbytes. In other words, 1024 X 1024 bytes or 1,048,576 bytes or 2 to the 20th power. This is a considerable amount of information, and is often used to measure things such as the size of a hard disk.

mkdev

mkdev is a program that creates the device file associated with a device. To the system, a device is simply a file that is written to or read from. Thus, the primary hard disk is associated with the file */dev/hd00*.

mount point

Mount point is a location from which you can reference your mounted filesystems.

panic

A fatal system kernel error from which the system cannot recover easily.

partition

A partition is a division of a disk that contains an entire operating system. If an entire disk is used for a UNIX system, there is a single partition on the disk.

process

A process is each program or separate part of a program that is running concurrently on a system.

RAM

RAM is Random Access Memory; it is the chip-based memory (or primary storage) as opposed to the hard disk (secondary storage). On systems with virtual memory (like those based on the 80386 processor), the RAM and disk storage are essentially one unit.

reboot

Reboot is the act of bringing up a powered down machine.

root

root is the top-level access account on a UNIX system that has unrestricted access to all files and utilities. This account is used only for system maintenance.

root filesystem

This is the filesystem containing the operating system and its utilities.

ROM

ROM is Read Only Memory; used to store software and data essential to starting the "boot" process.

runtime system

Runtime system, or RTS, is the minimum software necessary on a UNIX system to run properly. Other packages above the RTS can be loaded using **custom**(ADM).

sector

A sector is an arc-shaped section of a single track of a disk.

shutdown

shutdown is the program that shuts down the system in preparation for switching off or rebooting.

single-user mode

See **system maintenance mode**.

super user

Super user is another name for *root*.

swap space

Swap space is an area of the hard disk (not a filesystem) that acts as an extension of the hardware memory. Programs that are running but are waiting for input or device access may be "swapped out" or moved to the swap space so that other programs can run in memory.

system hang

A state in which a system process has come to an unexpected halt.

system maintenance mode

This mode is also known as single-user mode. This is a stage of the startup process where certain maintenance functions are done, and other users are not allowed to log in. Like the *root* or super user account, this mode has unrestricted access to the system.

tpi

tpi means tracks per inch, a measure of floppy disk storage density.

track

A track is one of the concentric rings that a hard disk is divided into, similar to a groove on a phonograph record.

utility

A **utility** is a program that is sometimes considered part of the operating system, but it is not part of the kernel. It is an independent user program that runs on top of the system like an application. New utilities can be written by users and are often known as "tools."

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