SCO® UNIX®
Operating System

Version 4.2
Release Notes

SCO® OPEN SYSTEMS SOFTWARE

SCO® UNIX® Operating System

Version 4.2
Release Notes

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Introduction

This document contains important information about the SCO® UNIX® System V Release 3.2 Operating System Version 4.2.

We suggest that you begin by reading through this introduction; it briefly describes the software and the documentation in the package.

Also, please note that certain hardware configuration information may be required for successful installation. This is detailed in the *Hardware Configuration Guide* in your documentation set. You should refer to appropriate sections of this guide if you have trouble installing the operating system.

The remainder of the software notes are organized into the following chapters:

- Important notes at a glance
- Before installing your software
- New features and enhancements in this release
- Security — new features and enhancements
- Administering your system
- Using your system
- Compatibility and conformance notes

> **NOTE** Please read through the chapter of these *Release Notes* entitled "Before installing your software," before installing the SCO UNIX System V Release 3.2 Operating System Version 4.2. In addition, pay particular attention to the sections of these *Release Notes* relating to peripheral devices such as printers, tape drives, or other hardware you are installing.

Chapter 4 will be of particular interest to existing users of SCO UNIX System V because it describes the new features that enhance this release and lists new utilities, and utilities that have changed. In addition, chapter 5 describes new security features and utilities.

Chapter 2 lists the most important caveats for SCO UNIX System V, and refers you to the appropriate section in the document for more information.

After installing this release, we suggest that you read through the remainder of the notes. Even if they are not immediately relevant, they may be of value in the future.

These notes are distributed in printed format and are also provided online in the software. To access the online version type the following:

man relnotes

We are always pleased to hear of users' experiences with our products, and welcome recommendations on how they can be improved. To help you in providing feedback, a questionnaire is included at the end of every manual. We give serious consideration to all written suggestions.

Conventions used in these notes

Utilities and commands are printed in boldface type, with the *Reference Guide* section in which they appear following in parentheses ( ), for example: **cat**(C). Filenames are italicized, for example; */etc/passwd*.

Contents of the distribution

This release is distributed on three different media: diskette, diskette/tape and diskette/CD-ROM. The composition of each of these packages is described below.

Diskette distribution

The SCO UNIX System V Release 3.2 Operating System Version 4.2 is distributed on 96tpi diskettes and 135tpi diskettes.

The distribution on 96tpi (5.25" high density) diskettes is as follows:

Volumes N1-N2
Volume M1
Volumes B1-B4
Volumes X1-X8

The distribution on 135tpi (3.5" high density) diskettes is as follows:

Volumes N1-N2
Volume M1
Volumes B1-B3
Volumes X1-X7

Diskette/tape distribution

The SCO UNIX System V Release 3.2 Operating System Version 4.2 is distributed on 96tpi diskettes and 135tpi diskettes with cartridge tape.

The distribution on tape and diskettes is as follows:

Volumes N1-N2
Volume M1
One 1/4 inch QIC cartridge tape

Diskette/CD-ROM distribution

The SCO UNIX System V Release 3.2 Operating System Version 4.2 is distributed on 96tpi diskettes and 135tpi diskettes with CD-ROM.

The distribution on CD-ROM and diskettes is as follows:

Volumes N1-N2
Volume M1
One CD-ROM

Packages in this set

The SCO UNIX System V operating system software is grouped into packages. This makes customizing your system easier because you can use the **custom**(ADM) utility to add or delete groups of programs that have related functions.

For example, if you do not want to use your system for communications, you would not install the UUCP package. If you install a package, then change your mind later, use **custom** to remove that package. **custom** can locate all the files that belong in a certain package and delete them.

> **NOTE** If you are planning to follow the requirements for a C2 system, you should not install the UUCP package. If you initially install UUCP and later decide that you want to follow the requirements for a C2 system, you must remove UUCP using **custom**.

Use **custom**(ADM) to determine the actual sizes in your set.

> **NOTE** It may be quicker to fully install the entire operating system and then use **custom** to remove those packages that you do not require. If you install the entire operating system, you should note that it will occupy approximately 40 megabytes (Mbytes) of disk space. In addition, you will need a minimum of 2 Mbytes of RAM. These are minimum figures; we recommend that you have 80 Mbytes of hard disk and 4 Mbytes of RAM.

UNIX System V Operating System packages

Package	Use/Contents
RTS	UNIX Run Time System
ALL	Entire Extended Utilities (includes all of the following)
AIO	Asynchronous raw I/O administration
BACKUP	System backup and recovery tools
BASE	Basic extended utility set
CSH	The C shell
DIAL	High speed Modem Dialers for UUCP
DOS	DOS utilities
FILE	File manipulation tools
GAMES**	Entire games package
KSH	The Korn shell
LAYERS	System V Layers
LINK	System V Link Kit files
LPR	Multiple line printer spooler
MAIL	Electronic mail and micnet
MAN	Operating system manual pages
MOUSE	Mouse and graphic input devices files
NETCFG	Netconfig
OAMPKG	Office automation and maintenance package
SCOSH	SCO Shell
SYSADM	Additional system administration tools
TPLOT	**tplot, graph,** and **spline**
UUCP*	**uucp** and **cu** communications utilities
VI	The **vi** and **ex** editors
VIDEO	Video Graphics configuration

*   The SCO UNIX System V Release 3.2 Operating System Version 4.2 is designed to meet the requirements of the C2 level of "trust" as defined by the *Trusted Computer System Evaluation Criteria*, also known as the "Orange Book." If you plan to follow these guidelines, the software package marked by an asterisk must not be installed on your system. By not installing this package, you can ensure that your system operates at a greater level of security.

**   Games is a separately installable package. After installing SCO UNIX System V, you will be asked whether you want to install the Games package.

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An explanation of custom(ADM) packages in this release

This section explains briefly what each package contains.

AIO
: This package allows the implementation of Asynchronous raw I/O.

BACKUP
: The utilities necessary to make copies of the files on your system. With this package, you can back up every file or just the files that have changed recently. You can also restore any part of these backups.

BASE
: The basic set of system utilities that are normally installed beyond the runtime system.

CSH
: The C shell command interpreter. An alternative to the Bourne shell, **csh** includes extensive command history features.

DIAL
: This package contains high speed modem dialers that can be used with UUCP.

DOS
: A set of utilities that allow listing, moving and copying MS-DOS files to or from an MS-DOS diskette or MS-DOS partition.

FILE
: A number of useful programs for comparing and manipulating files.

GAMES
: The Games package.

KSH
: The Korn shell, an alternative command interpreter that supports job control, command line editing, command history, and many other advanced features.

LAYERS
: A window facility for AT&T Blit terminals. The driver must be linked into the kernel, using **mkdev layers**, to use this package.

LINK
: The tools necessary to rebuild the system kernel. It is necessary to rebuild the system kernel if you are reconfiguring the system to tune system performance, networking the system, or adding capabilities to your system such as hard disks, tape drives, multiport serial cards, mice, MS-DOS filesystem support, and third-party device drivers.

LPR
: The printer spooler, which allows multiple print jobs to be queued for printing automatically.

MAIL
: This includes a number of subsystems, including MMDF and MICNET mail routing systems, which allow the transport of mail within the system and to other systems.

MAN	This package includes on-line copies of the System Administration (ADM), Commands (C), File Formats (F), Hardware Dependent (HW), and Miscellaneous (M) manual pages.
MOUSE	The utilities necessary to use mice, graphics bit pads, and so on with the system. Note that the kernel must be rebuilt using **mkdev mouse** before these utilities work correctly.
NETCFG	This package allow you to configure and enable network products.
OAMKPG	This package includes the UNIX System Laboratories (USL) utilities for installing applications.
SCOSH	The SCO Shell (SCOSH) package enables the less-experienced user to access applications and run complicated commands from a user-friendly interface. The package provides a shield to the command-line interface.
SYSADM	This is a package of additional system administrator tools. It is required for many system administration tasks.
TPLOT	Utilities for generating graphs. These programs work on a limited set of hardware.
UUCP	Utilities to connect your system locally or to a worldwide network of other systems. If you are planning to follow the requirements for a C2 system, you should not install the UUCP package.
VI	The **vi**(C) screen-oriented text editor including the **ex** editor.
VIDEO	A set of data files for configuring Video Graphics devices.

SCO UNIX System V documentation

The SCO UNIX System V Operating System documentation consists of several guides and references. Each has an extended name, such as the following:

SCO UNIX Operating System User's Reference

For ease of use, references to the book names within the documentation set are truncated. For example, the above manual is simply referred to as the *User's Reference*. For a more complete introduction to these documents, see the *Roadmap* and the *Tutorial*.

Software support

Direct software support (in the form of assistance, bug fixes, and so forth) is available to customers who purchased the SCO UNIX System V Operating System for use in the United States and Canada. If you purchased it for use outside of the US or Canada, please contact your distributor or retailer for support information.

Chapter 1
Important notes at a glance

These notes give a short description of the most important caveats that you will need to be aware of when using SCO UNIX System V. They also refer you to the appropriate section in this document for more information.

- Parallel and some serial serial cards are no longer automatically recognized at boot time. See "Non-recognition of serial and parallel drivers" (page 17).

- If you plan to use the update option, you must back up the existing system and verify the backup before proceeding with the update. See "Update" (page 13).

- If you plan to use the update option, and you are using a non-SCO driver as your root disk controller, see "Update" (page 13).

- If you are installing SCO UNIX System V on a hard disk that can be used in either AT compatible mode or SCSI mode, see "Disabling AT mode on the Olivetti ESC-1 host adapter" (page 18).

- There is a minor addition to chapter 2 step 38 of the *Installation Guide*. See "Using the system administration shell during installation" (page 19).

- If you plan to install SCO UNIX System V from a serial console, see "Installing SCO UNIX System V from a serial console" (page 28).

- During installation, should you see a message indicating that you have insufficient disk space, see "Fresh installation — insufficient disk space" (page 29).

- If you plan to install the SCO UNIX System V Development System Release 3.2.0, see "If you install SCO UNIX System V Development System Release 3.2.0" (page 29).

- If you plan to install the SCO UNIX System V Release 3.2 Development System Version 4.2, see "Installing the SCO UNIX System V Release 3.2 Development System Version 4.2" (page 30).

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- If you plan to install SCO Portfolio Version 1.0.1, see "If you install SCO Portfolio Version 1.0.1" (page 30).

- If you plan to install SCO Portfolio Version 2.0.0, see "Installing SCO Portfolio Version 2.0.0 during the operating system installation" (page 31).

- If you plan to install SCO Xsight, see "If you plan to install SCO Xsight" (page 32).

- If you plan to install SCO VP/ix, see "/etc/shadow and VP/ix vpixadm (ADM)" (page 79).

- If you plan to install SCO UNIX System V on a DPT PM2011/2012 host adapter, see "Installing SCO UNIX System V on a DPT PM2011/2012 host adapter" (page 33).

- If you plan to create a separate /u filesystem, see "Creating a separate /u filesystem" (page 34).

- If remapping of bad sectors is an issue, see "scsibadblk(ADM) and sector remapping for bad sectors" (page 49).

- If you plan to add a serial card at a non-standard address, see "Adding a serial card at a non-standard address or interrupt" (page 63).

- If you want to disable #! support, a new feature in SCO UNIX System V, see "Using and disabling #! support" (page 64).

- If you plan to install between 1 and 3 IBM dual asynchronous cards, see "Installing IBM dual asynchronous cards" (page 65).

- If you plan to use 8-bit character sets and have them recognized by UNIX utilities, see "Using the 8-bit character set" (page 65).

- If you experience poor tracking of a keyboard mouse, see "Installing a keyboard mouse" (page 65).

- The section "MMDF mail router" discusses known limitations with MMDF. See "MMDF mail router" (page 66).

- If you attempt to boot a kernel from a previous release, you may encounter problems. See "Booting old kernels" (page 67).

- **boot**(ADM) will not support **mem=** on Corollary architecture. See "boot(ADM) and mem= on Corollary architecture" (page 67).

- If you are booting on EISA machines, see "Booting on EISA machines" (page 67).

- If you encounter console display problems when booting, see "Console display problems when booting" (page 67).

- If you are thinking of changing a printer's **lpi** value, see "Modifying a printer's lpi value" (page 68).

- If you are thinking of removing the Link Kit, see "Removing the Link Kit" (page 69).

- If you are running MS-DOS under SCO UNIX System V, see "System security and DOS-under-UNIX system" (page 69).

- If you plan to install SCO® MPX™ on this release, you must use version 3.0 or a later version. See "MPX" (page 69).

- Modems do not understand scancodes. Do not enable scancode mode on a port communicating with a modem while attempting to dial. See "Scancode notes" (page 76), for this and other scancode notes.

- If you are located in the United States and require the **crypt**(C) software, see "Encryption software availability" (page 77).

- If you have problems with the numeric keypad, see "Numeric keypad problems" (page 78).

Chapter 2

Before installing your software

If a cover letter was included with your distribution, please read it first. Your installation instructions are in the *Installation Guide*.

Update

With this release, you can choose either to install the whole release or to use the new update feature to update from SCO UNIX System V Release 3.2 Operating System Version 2.x to SCO UNIX System V Release 3.2 Operating System Version 4.2.

The update guarantees the retention of all user data and core/system data configuration files, and attempts to retain most compatible SCO drivers.

You should note that the update only allows you to update from SCO UNIX System V Release 3.2 Operating System Version 2.x to SCO UNIX System V Release 3.2 Operating System Version 4.2. Users of earlier releases of SCO UNIX System V must reinstall from scratch by using the "Fresh" install option in the installation procedure. You cannot use this product to update from Version 4.0 or 4.1 to 4.2: to do this you would need to use the Maintenance Supplement Version 4.2.

In addition, the update will only update standard operating system software. It will not update add-on packages such as SCO TCP/IP and SCO® NFS®. If these add-on packages were installed under SCO UNIX System V Release 3.2 Operating System Version 2.x, they will be deleted when you update to SCO UNIX System V Release 3.2 Operating System Version 4.2, and will need to be reinstalled if they are still required.

Note that you will need a minimum of 10 Mbytes of unused disk space to use the update. In addition, you will need a minimum of 2 Mbytes of RAM.

It is essential that you back up your existing system before using the update. After backing up the existing system, you must verify the backup.

> **NOTE**   The update released with SCO UNIX System V Release 3.2 Operating System Version 4.2 is not intended to work on an SCO® Open Desktop® / SCO® Open Server™ system. Release 3.0 is the corresponding release to Operating System Version 4.2.

For more information on the update package, see Chapter 3 (page 35) of these notes and the *Installation Guide*.

Updating using a non-SCO driver for root disk controller

If you are using the update, and you are using a non-SCO driver for your root disk controller, an error message similar to the following example may be displayed:

```
Warning: mscsi - host adapter 'xxxx' not in mdevice
```

where xxxx is the code for your host adapter. If this message is displayed, wait until the installation has been completed and the prompt:

```
Boot
:
```

is displayed. Then reboot your system from the old kernel by typing:

unix.old

When you receive the message

```
Type (Ctrl)d to proceed with normal startup,
(or give root password for system maintenance):
```

you should give the *root* password and enter system maintenance mode and perform the following actions:

1. Move *unix.old* to a save file so that the system can be rebooted in the event of difficulties:

    mv unix.old unix.sav

    When you have successfully configured your system, you can remove *unix.sav*.

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2. Edit the file, */etc/conf/cf.d/mscsi*, to change the host adapter code to a code recognised by SCO UNIX System V Release 3.2 Operating System Version 4.2. Valid codes are:

ad	Adaptec 154x, 154x emulation, 164x
ciha	386/486 CBUS SCSI
dpt	DPT PM2012
eiad	Adaptec 174x
esc	Olivetti ESC-1
fdha	Future Domain 1650, 1670, 1680, 600, 700, (1800 Chip)
hf	IBM Hard File
spad	Adaptec 152x
sumo	Storage Plus SCSI-AT (SUMO)
tmcha	Future Domain 845, 850, 860, 885 (950 chip)
wdex	Future Domain 7000EX
wdha	Future Domain 7000

In the example, above, had the error message read:

```
Warning: mscsi - host adapter 'dptH' not in mdevice
```

you would need to edit your */etc/conf/cf.d/mscsi* file and change dptH to dpt.

3. Relink the kernel by entering the following command:

/etc/conf/cf.d/link_unix

4. Reboot the machine by typing:

haltsys

Updating packages currently installed

During the update installation, the Package Installation Choice menu invites you to update packages currently installed on your system. Any packages that are partially or fully installed on the system will be installed in full during the update. If, on your original system, you have installed and then removed a package from the Extended Utilities using **custom**(ADM), the package may remain partially installed. If you then update your system, the package will be fully installed again. You may wish to remove this package once the update is complete.

Using the update with SCO networking software

The update procedure may partially remove all networking software. Products affected include the SCO LLI Drivers, Microsoft LAN Manager for UNIX Systems, SCO TCP/IP, SCO NFS and SCO/Retix OSI.

NOTE If you have the SCO NFS Release 1.1.1 Maintenance Supplement on your system, after an "update" installation, **custom** will still report this supplement as being present on your system. Do *not* use **custom**(ADM) to remove this supplement as this can result in kernel relink errors. The supplement should be removed from **custom's** list by entering the following:

rm /etc/perms/nfsms

This section describes how to proceed if you have any release of the LLI drivers, Microsoft LAN Manager for UNIX Systems, or any SCO/Retix OSI components installed before you begin the update.

SCO LLI Driver Disk

If you have any SCO LLI Driver Disk installed on your system, only the following ethernet driver types can be expected to function successfully after the update installation:

- e3A
- e3B
- e3C
- wdn

If you have any other LLI drivers configured on your system, you must first deconfigure all the LLI drivers and then remove the LLI driver product. (For example, to deconfigure an EXOS driver, type **mkdev exos** and select the Remove option. Use **custom**(ADM) to remove the drivers.) When the update is complete, the LLI Driver Disk must be reinstalled (using **custom**) and all required LLI drivers reconfigured.

NOTE The update may remove LLI drivers that are not currently configured. If you require these drivers at some later date, you will need to deconfigure *all* LLI drivers, then remove the LLI driver product and reinstall it using **custom**.

Microsoft LAN Manager for UNIX Systems

Before performing the update, Microsoft LAN Manager for SCO UNIX Systems must be deconfigured. To do this, use **netconfig**(ADM) if installed over Net-BEUI and **mkdev lmx** if installed over TCP/IP. After deconfiguration, remove the following products from the system:

- Microsoft LMU NetBEUI
- Microsoft LMU UNIX Server
- Microsoft LMU UNIX Client

When the update is complete, reinstall those components of Microsoft LAN Manager for UNIX Systems that have been removed. Installation instructions for these components are included in their accompanying documentation.

> **NOTE** Microsoft LAN Manager for UNIX Systems is supplied with a set of LLI drivers. Please read the above section concerning the SCO LLI Driver Disk, since this also applies to the LLI Driver Disk supplied with Microsoft LAN Manager for UNIX Systems.

SCO/Retix OSI products

Before performing the update, all SCO/Retix OSI components (FT820, VT720, VT610, MH440, MH423) must be deconfigured and removed from the system. Use **netconfig**(ADM) to deconfigure the SCO OSI components, and **custom**(ADM) to remove the SCO/Retix OSI components.

When the update is complete, reinstall those components of SCO/Retix OSI that were removed. Installation instructions for these components are included in their accompanying documentation.

> **NOTE** SCO/Retix OSI is supplied with a set of LLI drivers. Please read the above section concerning the LLI Driver Disk, since this also applies to the LLI Driver Disk supplied with SCO/Retix OSI.

Non-recognition of serial and parallel drivers

With the release of SCO UNIX System V Release 3.2 Operating System Version 4.2, parallel and some serial cards are no longer automatically configured after the system is freshly installed or updated.

To configure these cards you must have the BASE and LINK packages of the Extended Utilities installed. These can be installed either during a fresh installation or after an update is complete as described below. If these packages were already present on your system before doing an update, then you have no need to reinstall them.

The BASE and LINK packages can be installed from within **custom**. If you are doing a fresh install, **custom** is run automatically, but if you are updating, you will need to enter the command:

    custom

Whether you are freshly installing or updating, you should then do the following sequence of actions:

1. Select Install from the menu.

2. Select SCO UNIX System V Operating System from the window.

3. Select Service Components from the list of options.

4. Select SCO UNIX System V Extended Utilities from the window.

5. Select Packages from the list of options.

6. From the list of packages, select BASE and LINK.

Once these components have been installed use sysadmsh to configure the parallel or serial ports. Enter:

sysadmsh

and follow the paths described below.

To configure parallel ports you need to select the following path through the sysadmsh menus:

System ⇨ Hardware ⇨ Parallel

To configure serial ports you need to select the following path through the sysadmsh menus:

System ⇨ Hardware ⇨ Card_Serial

For further information on these commands, see the chapter entitled "Adding serial and parallel ports" in the *Hardware Configuration Guide*.

Disabling AT mode on the Olivetti ESC-1 host adapter

Before installing SCO UNIX System V Release 3.2 Operating System Version 4.2 on a system on which the hard disk can be used in either AT compatible mode or SCSI mode, you should disable AT compatible mode. If you do not disable AT compatible mode, you will not be using the SCSI capabilities of your machine either during or after installation. AT mode can usually be disabled by using your system configuration disk — refer to your hardware documentation for further details. Examples of machines that require AT mode to be disabled are Olivetti CP486, LSX5010, M486 and Digital DS425.

Using the system administration shell during installation

Step 38 of the Fresh Installation procedure (refer to the *Installation Guide*) invites you to use **sysadmsh**(ADM) for adding users, configuring the system, or setting defaults. Attempts at this stage to use it for anything else (such as installing more kernel-modifying software) may exceed the restricted capabilities of the kernel used during installation.

If you are installing a system for which you have chosen the high security defaults, and you use **sysadmsh** to create a new user, the following message may be displayed when a password is assigned:

```
CONFIG: newproc - Process table overflow (NPROC = 20 exceeded)
```

This message has no adverse affect, and after installation the password can be used as expected. However, if you see this message, you are advised to wait until the installation of the operating system is complete before adding more users.

Boot-time loadable drivers

The boot-time loadable drivers (BTLD) feature allows you to load, at installation time, a device driver not supported by the delivered SCO UNIX System V system kernel.

Configuring devices at installation or boot time

You should read this section if any of these conditions are true:

- You are planning to install a combination of devices and do not want to install on the default device. For example, if you plan to install an ESDI device and a SCSI device, the operating system attempts to install on the ESDI device. If you want to install on the SCSI device, you need to override the default behavior using the **hd** bootstring.

- You have a tape distribution and you wish to configure your tape drive at a location other than the default. You can override the QIC-02 defaults using the **ct** bootstring, or the SCSI tape defaults with the **Stp** bootstring.

- You want to disable any erroneous presence tests or driver actions. You can override a device driver using the **disable** bootstring.

- In a post-installation scenario, you need to boot from a device that was not configured at the time that your kernel was created: for example, if you need to use your Emergency Boot Floppy Set to restore your system from tape and the tape configuration on your floppy no longer matches your current tape drive configuration.

Using bootstrings

A bootstring is a special command or string entered at the Boot: prompt displayed at system startup, a process that is normally transparent to the operator. For example, when you press ⟨Return⟩ at the Boot: prompt, the system uses a pre-defined bootstring from /etc/default/boot that tells the system how to boot (such as: **hd(40)unix**).

There are also special bootstrings that permit you to define device configurations that override system defaults (without relinking the kernel). For example, the UNIX System V tape installation assumes a SCSI cartridge tape configured at ha=0, id=2, lun=0. By using the appropriate bootstring, you can tell the system to recognize a different configuration (for example: ha=1, id=2, lun=0).

In a similar way, device drivers that are not present on the UNIX System V distribution media can be installed from a vendor-supplied floppy disk using the **link** bootstring as described in the "Using boot-time loadable drivers" appendix of the *Installation Guide*.

To define or redefine a device at boot time, do the following:

1. Decide which bootstring you need to use. Use the descriptions in this section to help you. Make certain the bootstring parameters you use actually match your hardware configuration. Additional bootstrings are documented in the **boot**(HW) manual page.

2. Turn the machine on and wait for the Boot: prompt. If you are performing an installation, note that this is the only time the Boot: prompt appears; you are not given the opportunity to reboot during the installation unless you are doing a tape installation.

3. Enter the necessary bootstrings separated by spaces. As mentioned earlier, other bootstring information (such as the location of the kernel) must be included on the boot line. You can use the bootstring **defbootstr** to represent the default boot information (for example: **hd(40)unix**) used when you press ⟨Return⟩. This is defined as DEFBOOTSTR in /etc/default/boot and saves you the trouble of entering the entire line. For example:

   defbootstr Stp=wdha(1,1,0)

   In the examples shown in this section, **defbootstr** is not shown, but remember that it should be included on the boot line.

4. The system then boots according to the information you provided. If you entered the bootstring incorrectly, an error message appears to that effect.

The following bootstrings are discussed here:

- QIC-02 cartridge tape (non-SCSI) configuration (**ct**)
- SCSI peripheral device configuration (**Sdsk, Stp, Srom**)
- SCSI host adapter configuration (**adapter**)
- hd driver configuration (**hd**)
- Disable driver (**disable**)

For additional information on the boot process and bootstrings, see the **boot**(HW) manual page in the *System Administrator's Reference*.

QIC-02 cartridge tape configuration

The **ct** driver bootstring is used to override the default tape configuration included with the tape cartridge distribution. It is intended for use during installation and does not replace the functions of **mkdev tape** described in the "Using floppy disks and tape drives" chapter of the *System Administrator's Guide*. If you later run **mkdev tape** to add a cartridge tape drive, you are prompted as to whether you wish to modify the current tape bootstring, retain it, or remove it entirely.

> **NOTE**   The **ct** bootstring only applies to QIC-02 cartridge tape drives; it does not work for SCSI, QIC-40, or Irwin drives. SCSI bootstrings are described in the next section.

The **ct** bootstring has the general format:

> **ct=***controller*(*base,irq,dma*)

where:

controller	=	Brand name of the tape drive controller
base	=	Base address
irq	=	Interrupt request number
dma	=	DMA channel number

For example, to perform a tape install from a Wangtek QIC-02 drive configured at a non-default setting, use a bootstring similar to the following:

> **ct=wangtek(0x338,5,1)**

Numbers prefixed with 0x are assumed to be hexadecimal; otherwise numbers are assumed to be decimal.

SCSI peripheral device configuration

SCSI device bootstrings allow you to install SCO UNIX System V from a device connected to the system at a SCSI address other than the default. For example, the **Sdsk** bootstring should be used if your hard disk is configured at a SCSI id that is not currently allowed as a boot device by the installation kernel. The syntax for SCSI bootstrings is:

periph=adapter(hanum,id,lun)

where:

periph	=	SCSI peripheral driver name (**Sdsk, Stp, Srom**)
adapter	=	host adapter driver prefix (see below)
hanum	=	host adapter number: 0-7
id	=	peripheral SCSI id: 0-7
lun	=	peripheral SCSI logical unit number (lun): 0-7

The SCSI peripheral driver names are as follows:

Sdsk	Hard disk
Stp	Tape
Srom	CD-ROM

Valid host adapter driver prefixes are:

ad	Adaptec 154x, 154x emulation, 164x
ciha	386/486 CBUS SCSI
dpt	DPT PM2012
eiad	Adaptec 174x
esc	Olivetti ESC-1
fdha	Future Domain 1650, 1670, 1680, 600, 700 (1800 chip)
hf	IBM Hard File
spad	Adaptec 152x
sumo	Storage Plus SCSI-AT (SUMO)
tmcha	Future Domain 845, 850, 860, 885 (950 chip)
wdex	Future Domain 7000EX
wdha	Future Domain 7000

For example, to perform a tape install from a SCSI tape device connected to the first Future Domain card (at id 2, lun 0) in a system, use the following bootstring:

Stp=fdha(0,2,0)

SCSI host adapter configuration

The **adapter** bootstring overrides the kernel's default configuration for a given host adapter. It has the following syntax:

adapter=*driver(base, int, dma)*

where:

driver	=	host adapter driver prefix
base	=	adapter I/O base address
int	=	adapter interrupt vector
dma	=	adapter dma channel

A list of host adapter driver prefixes appears in the previous section "SCSI peripheral device configuration."

If the kernel fails to recognize your SCSI adapter at boot time, or incorrectly identifies it, you can use the **adapter** bootstring to define it. For example, if you have an Adaptec 1522 board installed and the system fails to recognize it as configured, you would use a bootstring similar to the following:

adapter=spad(0x340,11,0)

NOTE Many EISA and MCA boards get configuration data exclusively from CMOS RAM and may ignore bootstrings.

hd driver configuration

The **hd** bootstring allows you to override the default search sequence used by the hd driver to determine the root disk. The syntax of the bootstring is:

hd=*device*

where:

device = disk driver prefix

Valid hd driver prefixes are:

wd0	Western Digital WD1000 ST506/ESDI Controller
ida0	Compaq IDA
esdi	IBM ESDI for Micro Channel
st506	IBM ST506 for Micro Channel
Sdsk	Generic SCSI disk front-end

This bootstring is required by some controllers (for example: Compaq IDA) and SCSI adapters that appear to be wd1010-style controllers; by default, **hd** recognizes the wd driver before the Sdsk driver, thus preventing Sdsk from being configured as the root disk.

To boot from a compaq IDA drive (in ida (non-wd) mode), you would use the following bootstring:

hd=ida0

Disable driver

The **disable** bootstring is used to disable any erroneous presence tests or driver actions that adversely affect software and/or hardware states. The syntax of the bootstring is:

disable=*driver*[,*driver*...]

Sometimes the system may detect a device that is not actually present. You can use the **disable** bootstring to disable the driver. For example, if you wanted to disable the dpt driver and boot from another device on the system, you would use the following bootstring:

disable=dpt

The **disable** bootstring is currently only supported for disabling SCSI host adapters.

Memory requirements

Please use the following table to determine the amount of memory you need to run the SCO UNIX System V Operating System:

System	Requirements
Operating System	minimum: 2 Mbytes (see Note below) recommended: 4 Mbytes multiuser: 4 Mbytes or more for optimum performance

NOTE On some machines, the UNIX system kernel cannot recognize the memory between 640 and 1024K because the hardware manufacturer may have mapped this 384K of memory to another location for their firmware to use. Because this location varies, the UNIX system kernel does not know where to find it. On most machines, BIOS and video ROM shadowing should be disabled.

The operating system requires at least 40 Mbytes of disk space (after formatting) to operate efficiently, including space for user files and swap space. If you plan to have security auditing enabled, you may need a very large amount of extra storage; a dedicated hard disk is recommended.

Compaq tape installation

The tape drive selection script displays several tape options, including the following:

- scsi
- compaq
- wangtek

If you are installing a Compaq (320/525 Mbytes) SCSI tape system, you should select *compaq* when installing the Operating System. Note that the tape device ID must be 0. The Compaq SCSI adapter should be configured as follows:

- addr = 0x130
- irq = 5
- dma = 7

If you are installing a Compaq 150/250 tape drive, choose *wangtek* and specify the following parameters:

- addr = 0x300
- irq = 5
- dma = 3

Compaq SCSI tape installation

You may select the Compaq SCSI tape installation during the installation procedure. If you do, then after confirmation of the Base Address, Interrupt Level and DMA channel of the controller, you will see the following message:

```
Enter the Compaq SCSI Target ID of the tape controller
(decimal integer):
```

You should then enter the SCSI Target ID (0 to 7) of the Compaq tape drive that you want to use for installation.

Hard disk interleave

With this release of SCO UNIX System V, 1:1 is now the preferred interleave for disk controllers that support it. Most modern disk controllers support a 1:1 interleave, but older, single-buffered MFM controllers do not. A controller's fastest/best interleave is one of its most widely published specifications; check your documentation. (Typically, a 3:1 interleave is suggested for MS-DOS.) However, if you are unsure and unwilling to experiment, we suggest that you format your drive using a 3:1 interleave. Although, with an appropriate controller, a 1:1 disk interleave can substantially improve I/O performance, an inappropriate disk/controller combination formatted 1:1 can reduce performance by a factor of 4 or worse. (Operations that would take 15 seconds on a drive with proper interleave could take as long as a minute.)

To determine if you have an interleave problem, first perform a minimal installation, then enter the command:

dd if=/dev/root of=/dev/null bs=1k count=4096

On a correctly configured system, this command could take as little as 3 seconds to complete. If the command takes longer than 15 seconds to complete, you could have a disk interleave problem and you may wish to reformat and reinstall before proceeding further. (However, it is also possible that your particular disk/controller combination is intrinsically slow, even when formatted at the proper interleave.)

Most new disk/controller pairs arrive already formatted at the proper interleave (3:1 for MS-DOS). If reformatting is necessary, it must be performed using the setup disk that came with your system, or a DOS formatting program.

Note that some disk/controller pairs, notably some SCSI and IDE pairs, have their own cylinder/head/sector translation logic, and will probably ignore any reformat command sent to them.

Future controllers

The slowest 386-based CPU, the 80386SX, can barely keep up with the fastest 1:1 double-buffered controllers. As transfer speeds surpass 10 Mbytes/sec, slower CPUs may not be able to keep up with the data transfer rate. Whether a problem occurs also depends upon the presence of on-chip cache and the amount of buffering on the controller. We are not aware of any specific CPU/controller combinations that cause a problem. If you find yourself with a fast ESDI controller, such as one with a 15 MHz transfer rate, a machine based on a comparatively slow CPU such as an 80386SX, and find that disk I/O performance is far worse than you would have expected with a slow disk, the recommended solution is to revert to a 2:1 or 3:1 disk interleave.

Saving an existing XENIX or UNIX system partition

If you have an existing XENIX or UNIX system partition on your hard disk that you wish to preserve, you must select the Fully Configurable Disk Initialization option during the installation, or the partition is wiped out.

Installing SCO UNIX System V from a serial console

If you intend to install SCO UNIX System V through a serial console, and you are not using a normal PC display adapter (VGA, CGA etc.), you must perform the following sequence of events after installing SCO UNIX System V. On first boot after installation:

1. Enter system maintenance mode.

2. Enter the following commands:

   cd /dev
   enable tty1a
   disable tty0[1-9] tty1[1-2]

3. Then enter the command:

   cd /etc/default

   and edit the *login* file. In this file you should change the value of the parameter **OVERRIDE** from tty01 to the tty line of the serial console; normally that value will be tty1a. After editing, the line in */etc/default/login* should (if the tty line is tty1a), read:

   OVERRIDE=tty1a

   After changing the value, save the file.

4. Edit the file */etc/default/boot* and add the following line to the end of the file:

   SYSTTY=1

   then save the file.

Using custom(ADM) in interactive mode

If you plan to install certain standalone products like TCP/IP and NFS, you will require the */etc/perms/unixos42* perms file on your system. Hence this release of the SCO UNIX System V is supplied with this dummy perms file.

This can be noticed when you execute **custom** in interactive mode. The **custom**(ADM) utility displays a blank entry in the product list menus. This can safely be ignored when using **custom**(ADM). You must ensure that you do not remove this blank entry.

Fresh installation — insufficient disk space

During a fresh installation of SCO UNIX System V, you may see a message suggesting that there is insufficient disk space to install the entire operating system. This message might appear when you choose to install the entire product from **custom**. Unfortunately **custom** wrongly calculates the amount of unused disk space. When the message is displayed, you will be given the option to continue with your installation. If you are certain that there is enough space (a minimum of 40 Mbytes is required), you should continue with the installation.

If you install SCO UNIX System V Development System Release 3.2.0

If you install SCO UNIX System V Development System Release 3.2.0 on your system, certain files are overwritten. These files must be replaced from your operating system distribution. This does not apply to SCO UNIX System V Release 3.2 Development System Versions 2.0, 4.0 or 4.2. After installing the development system, do the following:

1. Enter **custom** and press ⟨Return⟩ to select Install.

2. When the product window opens, use the ⟨Down Arrow⟩ key to highlight the SCO UNIX System V Operating System and press ⟨Return⟩.

3. Use the ⟨Left Arrow⟩ key to highlight Service Components and press ⟨Return⟩.

4. When the service component window opens, press ⟨Return⟩ to select SCO UNIX System V Runtime System.

5. Use the ⟨Left Arrow⟩ key to highlight Files and press ⟨Return⟩.

6. When the package window opens, press ⟨Return⟩ to select Entire RTS with perm lists.

7. When the file list appears, press the ⟨F5⟩ key to search. You should first search for a filename, then mark it with the ⟨Space⟩. Do this for each of the following files, one at a time:

   /usr/bin/infocmp
   /usr/bin/mcs
   /usr/bin/tic

   Now press ⟨Return⟩ to invoke the installation. You are then prompted to insert the necessary distribution volumes.

8. After these files are restored, you are returned to the top of the **custom** menu. Press ⟨Return⟩ to select Install and repeat steps 2-3, selecting SCO UNIX System V Extended Utilities this time.

9. Use the ⟨Left Arrow⟩ key to highlight Files and press ⟨Return⟩.

10. When the package window opens, press ⟨Return⟩ to select Entire Extended Utilities.

11. When the file list appears, follow the same procedure as in step 7 to restore the following file: /usr/bin/what. When the process is complete, all the necessary files have been restored.

Installing the SCO UNIX System V Release 3.2 Development System Version 4.2

If you are using the Packages option of **custom**(ADM) to install parts of the Development System, do not select the PERMS package. If you do, **custom** may ask you to insert the M1 disk, and may not subsequently recognise it. Installing any other package or the entire Development System will work as expected.

NOTE The PERMS package is used by **custom** itself and should not be installed by the user.

If you install SCO Portfolio Version 1.0.1

If you install SCO Portfolio Version 1.0.1, it runs properly, but after relinking the UNIX system kernel, running Portfolio results in the error message:

```
Can't open or access /dev/mvwdev (errorno = 2)
```

This is because the device /dev/mvwdev is not preserved when the kernel is relinked. To correct this problem, edit the entries **mvwc** and **mvws** in the file /etc/conf/cf.d/mdevice. Using a file editor, change the 3rd field in these entries from "ico" to "icor." The "r" indicates the entry is required. As long as the required flag is added to the **mvwc** and **mvws**, subsequent relinking will not remove /dev/mvwdev.

If you have already relinked the kernel and lost the device, log in as *root* and enter the following commands:

cd /etc/conf/cf.d
./configure -j mvwc

This command will return the major number of the mvw controlling device. Use the number obtained as the major number, *major*, in the following command:

mknod /dev/mvwdev c *major* 255

Installing SCO Portfolio Version 2.0.0 during the operating system installation

Step 22 of the Fresh Installation procedure (refer to the *Installation Guide*) permits the loading of additional software during installation of the operating system. If SCO Portfolio Version 2.0.0 is loaded at this stage, the kernel does not re-link either during or after the installation procedure. In order to use SCO Portfolio, the kernel must be relinked manually when the installation of the operating system is complete.

Updating a system on which SCO Portfolio Version 2.0.0 is already installed

If your system includes SCO Portfolio Version 2.0.0 when you perform the update installation, you will need to remake the windows after the procedure is complete. Failure to do this will cause SCO Portfolio to function incorrectly.

To remake the SCO Portfolio windows, proceed as follows:

1. Log in as *root*.

2. Type **op adm** at the prompt.

3. From the SCO Portfolio Administration menu, choose Utility.

4. Choose Make Windows.

5. Choose Update Changes.

6. The update installation also displaces from the */etc/rc* directories two control files which start and stop the SCO Portfolio calendar server. If you use the calendar after performing the update, the following message is displayed:

   ```
   No response from server
   ```

   You will need to recover the following files:

   /etc/rc2.d/S95calserver
   /etc/rc0.d/K95calserver

   To recover them, execute the following commands:

   cp /etc/rc.old/rc0.d/K95calserver /etc/rc0.d/K95calserver
   cp /etc/rc.old/rc2.d/S95calserver /etc/rc2.d/S95calserver

   Now set the file mode of the files to 774 using the **chmod**(C) utility as follows:

   chmod 774 /etc/rc0.d/K95calserver
   chmod 774 /etc/rc2.d/S95calserver

If you plan to install SCO Xsight

If you plan to install SCO Xsight Release 4.1.0, copy (or link) */etc/perms/unixos42* to */etc/perms/rts.UB* before starting the SCO installation procedure. Remove the */etc/perms/rts.UB* file when you have completed your installation.

The implementation of pseudo-terminals has changed with this release of SCO UNIX System V. Xterm and SCOterm released with Xsight Version 2.2 are compatible with SCO UNIX System V Release 3.2 Operating System Version 4.2 pseudo-terminal (pseudo-tty) device nodes. It is recommended that you use this version, or a higher version number of Xsight with this release of SCO UNIX System V.

Before installing SCO Xsight, you must run **mkdev mouse** and **mkdev ptty**.

SCO UNIX System V Release 3.2 Operating System Version 4.2 no longer contains *grafinfo* files. When installing SCO Xsight Release 2.2.0, and attempting to select Update during the execution of **mkdev graphics**, the following error message will be displayed:

```
Grafinfo files are missing
```

To work around this problem, you should postpone the video graphics card selection by selecting Quit followed by Exit. You will then be able to complete the installation of SCO Xsight. Following this, you should install the SCO Xsight 2.3 Server EFS which was supplied with your copy of SCO Xsight Release 2.2.0. The missing *grafinfo* files are supplied with this EFS and will be installed when the EFS is installed.

> **NOTE** Early versions of SCO Xsight Release 2.2.0 may not contain the SCO Xsight 2.3 Server EFS diskettes. If you do not have this software, you may obtain it from your nearest SOS bulletin board or through your normal sales channel.

> If you have the SCOterm EFS Release 1.0.0 for SCO Xsight, do not install it on this release of SCO UNIX System V. It will overwrite the **mkdev mouse** script with a version that is incompatible with this release.

Installing an older version of Xsight

If you need to install an older version of Xsight, you must create the required number of pseudo-tty devices by using **mkdev ptty** (see the *System Administrator's Guide* for instructions on running **mkdev ptty**). After running the script, you should then create old-style (BSD name-scheme) device nodes linked to the new device nodes by running **mkdev ptty xnodes**. This will automatically create the master and slave pseudo-tty nodes required by Xsight, and will associate the appropriate pseudo-mice with them.

NOTE The script **mkdev ptty xnodes** must be the last utility to be run as part of the process of configuring your system.

Manual pages

With this release of SCO UNIX System V, on-line manual pages are supplied in **compress -H** format. However earlier versions of **/usr/bin/man**, **/usr/bin/xman** and **/usr/bin/uncompress** do not support this format; they expect manual pages to be in packed format. To convert from compressed to packed format, you should use the command **/usr/man/bin/repackman -z**. To convert from packed format to **compress -H** format, run the command: **/usr/man/bin/repackman -Z**.

In addition, **messages**(M), which provides system service, kernel, and device driver error messages is supplied in this release of the product.

Installing SCO UNIX System V on a DPT PM2011/2012 host adapter

This release of SCO UNIX allows installation of the operating system on a DPT controller in "Native" mode. DPTFMT should not be used to set the disk's emulation parameters. The system must be configured as described here before installing.

For DPT 2011 ISA controllers, disable (or set to 0) the disk drive parameter tables for disks 0 and 1.

For DPT 2012 EISA controllers, use the machine's EISA configuration utility to set the disk drive parameters to 0 (DISABLE) and set the DPT card's "WD1003 Emulation Mapping" to DISABLE for both disks 0 and 1.

Creating a separate /u filesystem

You are required to have a /u filesystem on your boot disk if the disk contains more than 1024 cylinders. However, the installation procedure does not invoke **mkdev fs** to install /u automatically. This is because the **mkdev fs** program is highly interactive and is best performed after the operating system installation is complete. Future releases of the operating system will include the automatic invocation of **mkdev fs** at installation time.

Chapter 3
New features and enhancements in this release

This chapter summarises the new and enhanced features in this release of SCO UNIX System V.

Installation and update

With this release, there are three major enhancements to the SCO UNIX System V Installation Package. These new features are the ability to update your existing installation, the ability to install from CD-ROM and the introduction of support for boot-time loadable drivers.

Update

It is now possible to update from SCO UNIX System V Release 3.2 Operating System Version 2.x to Version 4.2 without completely overwriting Version 2.x. When you install SCO UNIX System V, the system will ask you to select either the update or the complete installation package. The update allows the retention of user data, core system data/configuration files; and the attempted retention of most compatible SCO device drivers.

In addition, the update will only update standard operating system software. It will not update add-on packages such as TCP/IP and NFS. If these add-on packages were installed under SCO UNIX System V Release 3.2 Operating System Version 2.x, they will be deleted when you update to SCO UNIX System V Release 3.2 Operating System Version 4.2, and will need to be reinstalled if they are still required.

> **NOTE** You must back up your system and verify the backup before updating to SCO UNIX System V Release 3.2 Operating System Version 4.2.

Installation from CD-ROM

This release of SCO UNIX System V is the first release to be distributed on CD-ROM.

Details of CD-ROM installation appear in the *Installation Guide*.

To install from CD-ROM, a new pseudo-device, **cdtape**(HW) has been created.

Boot-time loadable drivers (BTLD)

This new feature provides the ability, at installation, to load a device driver not supported by the delivered UNIX system kernel. The enhancement is provided by a facility that links a device driver into the kernel at the Boot: prompt. Drivers linked into the kernel in this way are known as boot-time loadable drivers (BTLDs).

The creation of the boot-time loadable driver facility has resulted in the creation of three new utilities: **btld**(F), **btldinstall**(ADM), **string**(M).

In addition, the **clone**(M) and **boot**(HW) commands have been modified.

Compaq Supplement Release 1.3

The following features of the Compaq Supplement Release 1.3 and later have been incorporated into the SCO UNIX System V Release 3.2 Operating System Version 4.2:

- EISA ROM
- Compaq IDA disk drive system
- Compaq SCSI tape drive system

A Supplement is no longer necessary to provide these features.

The *Release Notes* for the Compaq Supplement Release 1.3 state that it may be installed on SCO UNIX System V Release 3.2 Operating System Version 2.0 or *later*. This is incorrect; the Compaq Supplement Release 1.5 or earlier should not be installed on Version 4.2 of the Operating System.

Updating a system that contains the Compaq Supplement Release 1.3

The Compaq Supplement should be completely removed using **custom**(ADM) before you update your system to the SCO UNIX System V Release 3.2 Operating System Version 4.2. The update procedure does not detect the presence of the Supplement, and does not remove files and/or drivers that may conflict with the updated operating system.

If the update of the operating system has been performed with the Compaq Supplement installed, you will need to remove certain files and directories from the system manually. Proceed as described below.

1. Log in as *root*.

2. Delete the Supplement's directory structure and files, by executing the following command:

   rm -rf /usr/lib/compaq

3. Remove the Supplement's mkdev scripts individually, by typing the following:

   rm /usr/lib/mkdev/cpqmgr
   rm /usr/lib/mkdev/neth
   rm /usr/lib/mkdev/ctr

4. Remove the Supplement's system manager control file by executing the following command:

   rm /etc/cpqmgr

Support for the NE3200 driver

Support for the NE3200 driver is now available on the SCO LLI Driver Disk Release 3.1. You must obtain this from your SCO Reseller to support your NE3200 cards.

Support for the Token Ring driver

Support for the Compaq Token driver is now available on the SCO LLI Driver Disk Release 3.1. You must obtain this from your SCO Reseller to support your Compaq Token Ring cards.

SCO Shell

SCO Shell has been produced for the benefit of users who require an easy-to-use interface to the operating system. For users who want integrated software solutions and the freedom to select their own mix of independent programs, SCO Shell provides:

- custom menus for selecting your programs

- an easy-to-use file management interface that shields you from working directly with operating system utilities

- a custom work environment

- a text editor

To accompany the software, the *SCO Shell User's Guide* has been written with the novice user in mind. A user without computer experience should be able to quickly learn the essentials of SCO Shell. To aid learning, context-sensitive help is provided.

Using SCO Shell and SCO Portfolio on the same system

If you make changes to your Applications or Utilities list, (*.appllist2* and *.utillist2*) within SCO Shell, you may experience problems when next running SCO Portfolio. If so, remove the *.appllist2* and *.utillist2* files from your home directory. The default configuration of Applications and Utilities will be provided when SCO Portfolio is next invoked.

To avoid this problem, individual users should run only one of these applications, although SCO Shell and SCO Portfolio Release 2.0.0 may be installed on the same machine.

Long filenames

This Version 4.2 supports long filenames. In the Extended Acer File System (EAFS), a filename can now be up to 255 characters long.

When you install SCO UNIX System V, support for long filenames is the default, but you should note that when you use the update, the default only applies to the root filesystem. Other filesystems can be converted to an EAFS supporting long filenames by using the **fsck -E** command.

In addition, it is possible to allow the use of long filenames when you create a filesystem using **mkfs**(ADM), by using the -E option.

To allow portability between long and short name filesystems, **pax**(C), **cpio**(C) and **tar**(C) have a new -T option allowing them to truncate path components.

cpio(C) can be used to back up pathnames of up to 1024 characters.

In addition, all utilities that act on regular files and directories will now recognize 255 character filenames.

Symbolic links

The ability to create symbolic links has been added and is available on the EAFS filesystem. This enhancement overcomes the limitation of being unable to link files across filesystems.

At installation, filesystems supporting symbolic links are the default for the root filesystem. If other filesystems exist on your system and you want them to support symbolic links, you must run **fsck -E** on the filesystem. This will convert a filesystem to an EAFS supporting symbolic links.

When creating a new filesystem using **mkfs**(ADM), you must specify **-E** if the filesystem should support symbolic links.

Enhanced commands

In general, all utilities that operate on directories and files will follow symbolic links when they are encountered. There are exceptions to this generalisation such as **find**(C), **tar**(C), **cpio**(C) and **pax**(C). These commands require an option to be explicitly stated.

mkfs(ADM) has been altered to allow you to specify that a new filesystem should be able to support symbolic links.

ln(C) has a new **-s** option to create a symbolic link.

find(C) has new options, **-type l** and **-follow**, enabling symbolic links to be found and followed.

ls(C) has changes to the **-l** and **-F** options. There is also a new option, **-L**, listing the file or directory referenced by the link rather than the link itself.

The Korn shell has a new conditional expression, **-L**, to allow testing for symbolic links.

The **test**(C) command has two new flags, **-h** and **-L**. **-h** will be true if the file exists; **-L** will be true if the file is a symbolic link.

The **tar**(C), **cpio**(C) and **pax**(C) commands have a new option, **-L**, to indicate that symbolic links should be followed.

The manual pages for **rm**(C), **mv**(C) and **chmod**(C) have been changed to reflect the impact of symbolic links.

#! support in executable shell scripts

If you have a shell script which must be interpreted by a particular shell, you can use #! to make it happen.

Instructions for enabling or disabling the new #! feature can be found in the section entitled "Using and disabling #! support" in the "Administering your system" chapter of these notes.

DOS partitions

This release includes the following features in support of DOS compatibility:

1. Coexistence between SCO UNIX System V and DOS 3.2, 3.3, 4.0 and 5.0.

2. The ability to access a primary DOS partition from within SCO UNIX System V for DOS 3.2, 3.3, 4.0 and 5.0.

3. The ability to access up to 7 DOS virtual drives on a DOS extended partition (>32 Mbytes) from within SCO UNIX System V for DOS 3.x, 4.x and 5.x.

4. The ability to mount DOS partitions, including extended partitions and virtual drives, as filesystems under SCO UNIX System V.

5. The ability to copy files to and from DOS partitions, including extended partitions and virtual drives, and list the contents of DOS directories using the DOS utilities, (**doscp**(C), **dosdir**(C) etc.)

Modifications have been made to the **doscmd**(C) and **hd**(HW) manual pages to describe these enhancements.

Some versions of MS-DOS have restrictions; for example, ITT DOS releases previous to 3.10 cannot share the disk with the UNIX system partition or MS-DOS. For these releases, the UNIX system partition must occupy the whole disk.

As another example, an ITT MS-DOS+ Release 3.20 hard disk partition should not be made larger than 32 Mbytes. Activating a larger partition corrupts the MS-DOS+ ending cylinder. UNIX system **doscmd**(C) commands may not work when accessing an ITT MS-DOS+ Release 3.20 hard disk partition that is 32 Mbytes or larger.

Whenever you use MS-DOS and SCO UNIX System V on the same disk, if in doubt, install MS-DOS first, then install SCO UNIX System V.

POSIX/XPG3

With this release, SCO UNIX System V achieves full POSIX FIPS 151.1 compliance and full XPG3 compliance.

iBCS Edition 2

With this release, SCO UNIX System V achieves full Intel Binary Compatibility Standard Edition 2 (iBCS2) compliance.

Incorporated into this release is the USL Operations Administration and Maintenance (OA&M) installation package and the accompanying manual pages:

compver(F), **copyright**(F), **depend**(F), **installf**(ADM), **pkgadd**(ADM), **pkgask**(ADM), **pkgchk**(ADM), **pkginfo**(F), **pkgmap**(F), **pkgparam**(C), **pkgrm**(ADM), **prototype**(F), **removef**(ADM), **pkgmk**(ADM), **pkgproto**(ADM), **pkgtrans**(ADM) and **space**(F).

These utilities can be installed on the system by installing the OAMPKG package using **custom**(ADM).

UUCP interfaces and protocols

The following interfaces are now available with **uucico**(ADM):

UNIX   standard interface for serial lines and modems

TCP/IP   TCP/IP interface

TLI   Transport layer interface

TLIS   Transport layer interface with streams modules

The following protocols are now available:

g Standard UUCP protocol for connection over links (for example, serial lines, modems).

e Protocol for 8-bit error-free links (for example, TCP, TLI, TLIS). No error correction.

f Protocol for 7-bit only error-free links (for example, some X-25 PADs). Does a checksum on the entire file.

x Protocol for 8-bit X-25 error-free links. Does not work on some X-25 packet switched networks.

t Protocol for TCP/IP network connection to remote machines.

Additional interface options are available with TCP/IP, TLI, and TLIS. For a successful UUCP transfer using one of these additional interface options, a daemon is essential at the receiving end to detect the UUCP request. This daemon then starts the **uucico** daemon running on the remote machine. The two **uucico** daemons (one on each machine) deal with the details of the transfer. The following three sections provide examples for the super user in configuring each interface.

Additional options for the TCP/IP protocol interface

In the case of the TCP/IP protocol interface, the daemon that detects the UUCP request is the **inetd** network superserver. It listens to all the network ports and spawns the appropriate daemon to deal with the request. Port 540 is allocated to UUCP, and the daemon used is **uucpd**. The daemon **uucpd** starts **uucico**, passing the string **-iTCP** as an argument, which forces **uucico** to use the TCP/IP protocol interface.

The following entry must be present in the file */etc/services*:

```
uucp 540/tcp uucpd # uucp daemon
```

In addition, you will need to make several amendments as described below.

1. Uncomment the following entry to the file */etc/inetd.conf*:

```
uucp    stream  tcp   nowait  NOLUID   /etc/uucpd uucpd
```

2. Add the following entry to the file */usr/lib/uucp/Systems* (refer to the **systems**(F) manual page):

```
scoast   Never TCP,e Any - ogin: nuucp ssword:  (password)
```

where *scoast* is the name of the destination machine.

3. Add the following entry to the file */usr/lib/uucp/Devices* (refer to the **devices**(F) manual page):

```
TCP   TCP,e   -   Any   TCP   540
```

Additional options for the TLI interface

In the case of TLI, the daemon **uucico** is started by the **nls** (network listening service) server, which monitors a specific socket for requests.

To configure the network listening server, proceed as follows:

1. Create a port (for example, 256) for the **nls**, by adding the following line to the file */etc/services*:

    ```
    nls   256/tcp     # TLI port
    ```

2. Initialise the nls by typing the command:

    nlsadmin -i inet/tcp

3. Set up the nls service code by typing the following command (all on one line, as denoted by the backslash):

    **nlsadmin -a 101 -c "/usr/lib/uucp/uucico -r0 -iTLI -u \
    nuucp" -y "<nls service>" inet/tcp**

4. Tell the listener which socket address it should be listening on. The address is a 16-byte *hexadecimal* number, derived as follows:

    a. The first byte is the address family (AF_INET in this case, which is defined as 2 in the file */usr/include/sys/socket.h*).

    b. The second byte is 0.

    c. The third and fourth bytes are the port on which the nls is listening (the second field in the entry you added to */etc/services*).

    d. The fifth, sixth, seventh and eighth bytes are the IP address of the machine on which the nls is running.

    e. The remaining eight bytes are all set to 0.

    Therefore, in this case, if the machine on which the nls is running has IP address 150.126.4.22 (that is 0x96.0x7e.0x04.0x16), the entire socket address is:

    ```
    0x02000100967e04160000000000000000
    ```

    (You can use the **bc**(C) command to convert between decimal and hexadecimal numbers.)

5. Configure the nls to listen on that address by typing the following command:

    nlsadmin -l "\x02000100967e04160000000000000000" inet/tcp

6. Start the nls by typing the following command:

    nlsadmin -s inet/tcp

To configure the machine initiating the connection, three files must be edited.

1. Add the following entry (all one line, as denoted by the backslash) to the file */usr/lib/uucp/Systems*:

```
scoast   Never   TLI,g   Any \
\002\000\001\000\226\176\004\026\000\000\000\000\000\000\000\000
```

where *scoast* is the listening server machine name.

(When an address is typed in the Systems file, it should be given in bytes, exactly as it was given in the nls case. However, the bytes should be expressed as \000 where 000 is the *octal value* of each byte.)

2. Add the following entry to the file */usr/lib/uucp/Devices*:

```
TLI   inet/tcp   -   Any   TLI   \D   nls
```

3. Locate the following entry in the file */usr/lib/uucp/Dialers* (refer to the **dialers**(F) manual page):

```
nls   ""   ""   NLPS:000:001:1\N\c
```

and replace it with:

```
nls   ""   ""   NLPS:000:001:101\N\c
```

where 101 is the service number of the listening service requested by the TLI.

> **NOTE** Test the uucp connection with the command:
>
> **/usr/lib/uucp/uutry -x9 -r scoast**
>
> where *scoast* is the appropriate machine name.
> Also, you should ensure that the file */usr/lib/uucp/Permissions* contains a suitable entry for the uucp user, for example nuucp.

After configuring the nls service to work on the ports selected, you can either add an entry to the */etc/inittab* file, or write a new script to execute the steps above. Edit the file *S88USRDEFINE* in the directory */etc/rc2.d*, adding the relevant information to start the nls so that this service is executed automatically when the system goes into multiuser mode.

Additional options for the TLIS streams-based transport provider

Use the */usr/lib/uucp/Devconfig* file to define which STREAMS modules should be pushed on top of the TLI transport provider. Entries in the Devconfig file have the following format:

```
service=uucico device=TLIS push=x[:y:z...]
```

where x, y, z . . . are the names of STREAMS modules, specified in the order that they are to be pushed onto the stream.

To configure the network listening service, follow the procedure described above for TLI, with the following exceptions:

1. Replace the keyword TLI with TLIS wherever it appears in file entries.

2. Set up the nls service by typing the following command (all one line, as denoted by the backslash):

   **nlsadmin -a 101 -p x,y,z -c "/usr/lib/uucp/uucico **
   -r0 -iTLIS -u nuucp" -y "<nls service>" inet/tcp

   Note the use of the **-p** argument. This is used to specify the names of the STREAMS modules in the order that they are to be pushed onto the stream. The modules used must be identical to those specified in the *Devconfig* file entries.

   For example, an entry in *Devconfig* of the form:

   ```
   service=uucico device=TLIS push=ptem,tirdwr
   ```

   would require the following command (all one line, as denoted by the backslash) to set up the nls service code:

   **nlsadmin -a 101 -p ptem,tirdwr -c "/usr/lib/uucp/uucico **
   -r0 -iTLIS-u nuucp" -y "<nls service>" inet/tcp

After configuring the nls service to work on the ports selected, you can either add an entry to the */etc/inittab* file, or write a new script to execute the steps above. Edit the file *S88USRDEFINE* in the directory */etc/rc2.d*, adding the relevant information to start the nls so that this service is executed automatically when the system goes into multiuser mode.

MMDF

The version of MMDF supplied by the University of Delaware, and distributed with this release of SCO UNIX System V, has been updated to level 43.

Enhancements to MMDF are:

- receipt of mail in MMDF CONTROL-A format or OLD undelimited format
- SCO-provided User Agents work with both MMDF and OLD mailbox formats
- enhancement of mail forwarding
- addition of nameserver support
- uucp channel has been changed to reduce data transmission

Changes to MMDF have resulted in changes to the following manual pages:

checkque(ADM), **list**(ADM), **maildelivery**(F), **mmdftailor**(F), **rcvtrip**(C), **submit**(ADM) and **tables**(F).

Hi-speed modem dialer

Hi-speed modem dialer support has been incorporated into SCO UNIX System V Release 3.2 Operating System Version 4.2. This feature provides the ability to create dialers for high-speed modems without the need to use a development system. Default dialer entries for the following are listed in the "Modem support" chapter of the *Hardware Configuration Guide* in this documentation set.

Pseudo-tty

Pseudo-tty handling has been removed from the **mkdev mouse** script. There is a new **mkdev ptty** script — see the *System Administrator's Guide* and the **mkdev**(ADM) manual entry for full details. The new script allows you to add or remove pseudo-ttys. The introduction of extended minor device numbers means that the combination of the new pseudo-tty driver and the **mkdev ptty** script is incompatible with pre-Release 3.2 Version 4.2 releases of these applications: SCO Multiview, Office Portfolio and Xsight. For SCO Multiview, use a version later than 1.6.5; for Office Portfolio use a version later than 1.0.1, 1.0.2 (German) and 1.0.3 (French). Xsight Release 2.2 and later releases will work with SCO UNIX System V Release 3.2 Operating System Version 4.2.

mscreen

With this release, all pseudo-tty drivers are merged into a single driver. This means that mscreen can no longer 'reserve' pseudo-tty devices, and that mscreen's getty session should not be started by **init**(M) on a pseudo-tty line. From a user's point of view, it is no longer necessary to enable pseudo-ttys to be used by mscreen; but after installing SCO UNIX System V, you should run **mkdev ptty** to create the number of pseudo-ttys that are likely to be required by your users. As a general guideline, the recommended number is two or three per user — so if you have 8 users, you should create 16-24 pseudo-ttys.

Mouse support

Mouse support has been improved to provide support for the full range of Logitech Mousemen in full three-button mode. Installation and configuration information are detailed in the chapter entitled "Adding mice and other graphic input devices" in the *Hardware Configuration Guide* in this documentation set. In addition, a full list of supported mice appears in the *Hardware Compatibility Guide*, also in this documentation set.

The constraint on host bus adapters has been reduced. Theoretically there is no upper limit, but the maximum tested configuration is 2 adapters per system and 7 devices per adapter.

Scatter-gather functionality has been added to the SCSI driver. Scatter-gather is a technique that the operating system can use to more efficiently read or write data on a hard disk or other storage device.

Despite these changes, existing third party SCSI device drivers and adapter drivers will remain compatible.

An increasingly large number of SCSI adapters and devices are now compatible with SCO UNIX System V. See the *Hardware Compatibility Handbook* for a full listing of supported host adapters.

To implement these enhancements, changes have been made to the **mkdev hd** script — see the *Hardware Configuration Guide* for details and the **mkdev**(ADM) manual entry. Enhancements have been made to the SCSI sub-system resulting in changes to the following utilities: **boot**(HW), **disk**(HW), **mdevice**(F), and **scsi**(HW).

PC scancode support

Most terminals send information to the operating system in the form of key-top values; that is, characters that appear on the face of keys. However, a few terminals now support PC scancodes. PC scancodes are unique values, associated with the depression and release of each key, that are used by a number of applications and environments. SCO's implementation of PC scancodes supports a standard interface allowing a windowing system to pass scancodes to scancode applications running in windows.

The introduction of scancode support has led to changes in the following manual pages:

getty(M), **gettydefs**(F), **keyboard**(HW), **mapkey**(M), **mkdev**(ADM), **screen**(HW), **serial**(HW), **setkey**(C), **stty**(C), **termcap**(F), **terminfo**(M), **termio**(M) and **tset**(C).

In addition, two new pages, **scancode**(HW) and **scanon**(M), have been added to the documentation set.

System administration

A number of enhancements have been made to the **sysadmsh** utility to improve usability.

The **sysadmsh** utility is now extensible at the top level. In addition to the standard pull-down menus, there is a new menu that permits user-configurable menus to be added at the top level. A new manual page, **menumerge**(ADM), describes this feature.

The **sysadmsh** utility can now be accessed with a mouse. On suitably equipped terminals it is possible to select menu items and pick and point items, and select fields in forms, in concert with normal keyboard actions. To support these enhancements to **sysadmsh**, the **sysadmsh**(ADM) manual page has been updated.

Auto-sensing of devices

There are improvements to auto-sensing and the facility to switch off auto-sensing. The principal benefit of this enhancement is that many potential clashes with interrupt vectors and base addresses can now be detected before they occur.

The serial and parallel drivers have been changed so that they now use user-supplied information to determine which device to configure. This means that the user must specifically add support for a particular card/port to the kernel before it can be used.

mkdev serial has been updated to prompt the user to enter the board and configuration that is being used. There is a new script, **mkdev parallel**, that allows the configuration of multiple parallel ports.

Asynchronous raw disk I/O

This release sees the introduction of asynchronous raw disk I/O for those applications that manage their own raw disk partitions. Asynchronous raw disk I/O can be installed using **custom**(ADM) from the AIO package distributed with this release.

The following manual pages have been added to the documentation set: **aio**(M), **aio**(F), **aioinfo**(ADM), **aiolkin**(ADM) and **aiomemlock**(F).

Unified getty(M)/uugetty(ADM)

The **getty**(M) and **uugetty**(ADM) commands have been unified into a single **getty**(M) command. The new **getty** command provides the additional functionality that was supplied by **uugetty**(ADM) in previous releases of SCO UNIX System V. **uugetty** still exists, but only as a link to **getty**.

scsibadblk(ADM) and sector remapping for bad sectors

A new utility, **scsibadblk**(ADM), is included with this release. This utility can scan selected areas of a SCSI hard disk for "bad" blocks which can then be reallocated. The utility can also turn on the SCSI features "Automatic Read Reallocation on Error" (ARRE) and "Automatic Write Reallocation on Error" (AWRE).

Note that many models of SCSI hard disk do not support the automatic reallocation features (ARRE and AWRE). A small number of SCSI hard disks also do not support sector reallocation at all. Drives which do support reallocation may restrict how many bad sectors can be handled from within any one track or cylinder of the drive; if those restrictions are exceeded, the drive must be reformatted with a SCSI low-level format program. There is currently no software solution to these problems; if necessary, contact the manufacturer of the drive.

Running vtp, mscreen and xterm simultaneously

When running Microsoft LAN Manager for UNIX Systems Release 1.1.0 on Version 2.0 of the operating system, a conflict was observed between **vtp** and other utilities such as **mscreen**. To resolve this problem, it was necessary to add an **-e** flag to the vtpsrv entry in the file */usr/lib/lm/lmx.servers*; this flag sets the vtp server to expect enabled pseudo ttys.

On Release 3.2v4.2 of the operating system, the addition of the **-e** flag is no longer necessary. **vtp**, **mscreen** and **xterm** all use disabled pseudo ttys, so **vtpsrv** should not be run with the **-e** flag.

New default value for ULIMIT

ULIMIT specifies, in 512-byte blocks, the size of the largest file that an ordinary user may write. The default value for this parameter is now 2097151. Doubling this new default value does not exceed the absolute allowable limit.

New MODE_SELECT kernel parameter for slow printing

If you have a parallel printer which prints abnormally slowly, check that your configuration matches the information given in the "Installing parallel and serial printers" chapter in the *Hardware Configuration Guide*.

If your printer is still slow, that is, of the order of four seconds per line, your printer may be deselecting itself after receiving each line of text.

The parameter value of **MODE_SELECT** can be changed by executing **/etc/conf/cf.d/configure** and changing the appropriate option. **MODE_SELECT** is a new kernel parameter, which is defined in *mtune* file and has a default value of 1 which enables mode-select checking. Setting this value to 0 will disable mode-select checking, and hence remove the printing delay incurred by these checks.

Additional options to mkdev parallel

When using **mkdev parallel**, in addition to adding and removing parallel ports, you can now choose to view the current configuration or get more help for this **mkdev** session.

Also, the allocation of device nodes to driver ports is now set at configuration time and remains the same for the life cycle of the driver. In the event that a driver is removed, the device node remains unallocated until it is reallocated.

Additional option to mkdev ptty

mkdev ptty, which is used to create pseudo-ttys, has been updated to include a third option. This option provides information on the number of pseudo-ttys configured in the system.

corex(C) converts new-style core files

A new utility, **corex**(C), converts the new-style *core* dump file to the old-style format for backwards compatibility. The new format enables debugging of the dump image by providing information on the process' address space (in particular, any attached shared memory areas), the state of the system at the time of the core dump and some additional information on the system.

This new format is fully documented in the revised **core**(FP) manual page in the Development System (Version 4.2).

Multi-volume CPIO backups with SCSI tapes

Having completed the first volume and inserted the next as prompted by the system, the system must be given time to initialize the tape drive before you press ⟨Return⟩ to continue the backup. This initialization can be indicated by the active drive light and/or by the resetting sound from the physical drive.

Appropriate error messages are displayed if you press ⟨Return⟩ before the initialization.

New ORTSFL flag for hardware flow control

In addition to CTSFLOW and RTSFLOW flags, ORTSFL is now available for CTS and RTS handshaking and provides hardware flow control. The available combinations are detailed in the **stty**(C) and **termio**(M) manual pages in this release.

getserno(C) prints binary file serial number

A new utility, **getserno**(C) prints the SCO serial number as branded on the named binary file. Appropriate error codes are returned depending on the status of the binary file.

New option gives extra 30% compression using compress(C)

compress(C) includes a new option, **-H**. Using this option can save approximately 30% more space than when the option is not used. **uncompress**(C) automatically detects when files have been compressed using the **-H** option, and processes them appropriately. Previous versions of **uncompress** do not recognize files compressed using the **-H** option.

Note that files compressed with this option are not portable to non-SCO systems or previous SCO OS releases.

file(C) reports regular compressed files as "compressed data," and files that were compressed using **-H** as "LZH-compressed data."

mail(C) now makes all non-printable characters visible

When **mail**(C) either displays messages on a user's tty or when messages get piped through the **PAGER**, **mail**(C) makes all non-printable characters visible.

A new variable, **visible**, has been added to **mail**(C). This variable is enabled by default. This can be disabled by executing the **unset visible** command either at the " & " prompt within the mail program for this session or by specifying this command in your **$HOME/.mailrc** file.

When the visible switch is on and the **mail**(C) output is going to a tty or through the **PAGER**, non-printable characters are transformed as follows:

Control characters (with the exception of tabs, newlines and formfeeds) are transformed into ^X (^ followed by X), where X is the key pressed with the ⟨Ctrl⟩ key (for example, ⟨Ctrl⟩A, octal 0001, is transformed to ^A). The ⟨Del⟩ character (octal 0177) is transformed to ^?.

Non-ASCII characters between octal 0200 and 0237 are transformed into M-^X, where X is the control character specified by the seven low order bits (for example, octal 0201 would be transformed into M-^A). Octal 0200 is transformed into M-^@.

Characters between octal 0040 to 0176 and octal 0240 to 0377 inclusive, are considered printable and are not transformed.

Additional option to uname(C)

A new option, **-A**, has been added to **uname**(C); it prints the activation state of the operating system. This value is the same as the license field displayed by **uname -X**.

Updates to tar(C)

This section lists the updates to the **tar**(C) utility:

- Using **tar**(C) with variable block-sized tape devices

  When using **tar**(C) on tape devices which support variable block sizes for reading and/or writing, the archives are created in 512-byte blocks by default. The 10 kilobytes value given in */etc/default/tar* is not used.

- Using **tar**(C) on filesystems without long filename support

  You are reminded that the **-T** option of the **tar**(C) command may be used to truncate filenames on tar archives to fourteen characters. This ensures that they may be read on old-style systems that do not support greater than fourteen character-length filenames.

- Using **tar**(C) for archive extraction as *root*

  When extracting the contents of a tar archive as *root*, if there is a need to create directories, then the ownership and group identification of the directory is set to that of the first file on the archive which belongs within that directory.

Increased MAXSC value improves performance

The default value for the **MAXSC** kernel tunable parameter has been increased from 1 to 8. This means that up to 8 pages are passed to the **swap( )** routine for swapping, rather than just one.

The **swap( )** routine has also been modified to determine if the disk adapter driver can handle scatter-gather requests, and if so, pass multiple pages to the driver in a scatter-gather buffer header. This improves performance on systems which swap heavily by using scatter-gather to swap multiple pages out at once, instead of swapping pages out synchronously one by one.

New maximum value for NOFILES kernel parameter

The **NOFILES** parameter represents the maximum number of files that can be held open by any one process at a time. In the previous release, the parameter values ranged from 60 (minimum and default) to 150 (allowable maximum). In this release, **NOFILES** can be tuned between 60 (minimum and default) and 11000 (allowable maximum). This allows large applications, like databases, that need to have a large number of files open simultaneously, to improve their performance. Increase this value if advised by your application vendor to do so.

If you need to modify this parameter, then you will most likely need to update a number of other kernel tunable parameters accordingly. For example, an increase in **NOFILES** requires a corresponding increase in the **NINODE** (number of allocated inode entries) and **NFILE** (number of allocated open file entries) parameters.

This parameter value can be changed by executing **/etc/conf/cf.d/configure** and selecting the appropriate option.

Using the audit reduction program with a high NOFILES value

If you configure your kernel with a high NOFILES value, the audit reduction program, **reduce**(ADM), may be unable to allocate sufficient memory to process an audit session.

If this occurs, you will see a message similar to the following:

```
Error on malloc of proc/file table space
```

If you choose to execute this audit reduction program, ensure that the following memory requirement for **reduce** is satisfied:

memory required = (NPROC * NOFILES * 8) bytes + 1 MByte

Additional "cache" option for boot

A new option, "cache", has been added to **boot**(HW). This controls the i80486 and Pentium internal cache. The following flags are recognized:

/n   The internal cache is off after the kernel is loaded. This may be necessary for some machines where there are problems with cache coherency (this occurs when DMA does not notify the internal cache that memory has been written to directly).

/y   The internal cache is on after the kernel is loaded (this is the default). Machine performance will be enhanced if caching is enabled.

/d   Flush cache code is disabled. Booting will take less time if flushing is disabled, however, this may cause some machines to fail to boot.

/e   Flush cache code is enabled (this is the default).

Single binary set

This release sees the end of separate releases for different bus architectures. SCO now supplies a single set of binaries that will boot on the ISA, MC and C-BUS architectures. SCO UNIX System V will boot on some EISA computers, but full EISA support is only guaranteed on those machines listed in the *Hardware Compatibility Handbook* in this documentation set.

Chapter 4

Security — new features and enhancements

SCO UNIX System V is designed to meet the requirements of the C2 level of "trust" as defined by the Department of Defense's *Trusted Computer System Evaluation Criteria*, also known as the "Orange Book." To implement the principles of trusted operation, a number of modifications were made that greatly exceed the security features of most UNIX Systems. Each aspect of operation is controllable by selection through the **sysadmsh**(ADM) menu interface.

This release of SCO UNIX System V allows you to select from four predefined levels of security, two of which set a level that is equal to or greater than that required by C2. If you do not plan to follow the C2 guidelines, it is possible to configure more traditional UNIX system behavior at installation time, or later using the **sysadmsh**.

All aspects of security configuration and adding users are covered in the "Administering user accounts" chapter of the *System Administrator's Guide*. The C2 requirements for security documentation are satisfied by the "Maintaining system security" and "Using the audit subsystem" chapters of the *System Administrator's Guide* and the "Using a trusted system" chapter of the *User's Guide*.

New security levels

SCO UNIX System V can now be initialized to one of four security levels. These levels, superceding the "C2" and "Relaxed" modes of earlier releases, are described in the following table:

Level	Use
High Security	Recommended for systems holding confidential information that are accessed by many users. Meets or exceeds C2 guidelines.
Improved Security	Recommended for systems accessed by groups of users who may share information. Meets or exceeds C2 guidelines.
Traditional UNIX System Security	Provided for compatibility with other UNIX Systems.
Low Security	Recommended for systems not publicly accessible and used by a small number of cooperating users.

The required security mode can be selected at installation, but you are not committed to the selected mode: it is possible to switch modes or tune individual parameters after installation.

If you select the high security option, your system will support a level of security higher than that required by C2. Improved Security, the second level of security, is approximately equivalent to the C2 selection of previous releases; the third level is equivalent to the "Relaxed" selection of previous releases. The Low Security option relaxes some of the traditional UNIX system security restrictions.

| **NOTE**   If you are planning to follow the requirements for a C2 system, you should not install the UUCP package.

This section lists the new security features and commands that enhance this release of SCO UNIX System V. There are restrictions on the use of some of the commands described below at the high security level. Refer to the *System Administrator's Guide* for more details; information is contained in the chapters entitled "Maintaining system security" and "Using the audit subsystem."

Object reuse

The Object Reuse requirements stated in the "Orange Book" are satisfied in SCO UNIX by clearing unallocated disk and memory area (object) before it is allocated to a new process (subject).

Password mirroring

SCO UNIX System V now maintains user password information in */etc/passwd* or */etc/shadow* files as well as in the protected password database. This means that you can administer the system using traditional UNIX system administration techniques if the system is in one of the relaxed security states.

Two new commands, **pwconv**(ADM) and **pwunconv**(ADM), create and remove the */etc/shadow* file.

ale(ADM)

ale(ADM) allows administrators to write shell scripts to update the authentication databases. It handles the locking of security database files to prevent corruption.

ap(ADM)

ap(ADM) allows account profiles to be dumped in a portable format so they can be restored on other SCO UNIX systems.

asroot(ADM)

asroot(ADM) allows users to run a restricted selection of commands as the super user, without knowing the root password.

cps(ADM)

cps(ADM) creates (if necessary) a specified file and sets its permissions to match its entry in the File Control database.

fixmog(ADM)

fixmog(ADM) corrects permissions on files so that they match their entries in the File Control database.

rmuser(ADM)

rmuser(ADM) allows administrators to completely remove a user's account and associated data from the system.

sdd(ADM)

sdd(ADM) allows system daemons, such as **cron**, to be restarted from the command line, without setting an LUID.

ttyupd(ADM)

ttyupd(ADM) updates the Terminal Control database so that it contains entries for all lines in */etc/inittab* that start **getty**(M).

unretire(ADM)

unretire(ADM) allows a retired account to be reactivated.

prwarn(C)

prwarn(C) gives a warning before a password expires. This allows users to have a new password prepared when their password needs to be changed.

New features in authck(ADM)

- **authck**(ADM) has a new **-y** flag for correcting errors in the Subsystems database without user intervention.
- **authck**(ADM) can now detect a wider variety of errors in the Subsystems database.
- It will now detect, and optionally correct, inconsistencies between information in */etc/passwd* or */etc/shadow*, and the protected password database.
- **authck -p** will now optionally create protected password database entries for users who only have entries in */etc/passwd*.

New features in passwd(C)

- **passwd**(C) now supports the new "passwd" subsystem authorization. A user who has this authorization may change any user's password (without knowing the original).
- **PASSLENGTH** in */etc/default/passwd* now overrides the computed minimum password length.

New features in su(C)

- The "su" subsystem authorization now allows a user to **su** to any account instead of just the *root* account.

- **su**(C) now transfers the kernel and subsystem authorizations of the assumed user to the invoker of **su**. This feature is tunable by a kernel tunable parameter; it may be on or off depending on the chosen security level.

New features in login(M)

- **login**(M) can now suppress copyright and other messages during a login. See the **login**(M) manual page for instructions on setting the **ALLOWHUSH** parameter.

- **login**(M) displays a count of the number of unsuccessful logins since the last successful login.

- **login**(M) can now be configured to create a Terminal Control database entry for the line on which it is invoked, if the line's entry is missing.

Integrity error messages

The **useshell** helper program, used by **sysadmsh** when creating user accounts, now displays descriptive error messages when integrity errors are encountered.

Auditing of print jobs

The submission of print jobs to the lp system can now be audited.

Supplemental group support

- The new **sg**(C) command allows you to change the members of your supplemental group list.

- The supplemental group list is now set by **login**(M), **su**(C), and **cron**(C).

- **id**(C) now reports the supplemental group list.

Enhanced crash recovery

The crash recovery script, **tcbck**(ADM), has been enhanced so that it automatically repairs protected password and subsystems database errors.

Removing security database files

It is possible to completely remove the commands and data files associated with the security enhancements in SCO UNIX System V. You may do this if you wish to reclaim the disk space used, or to speed up the boot and login procedures.

You should be aware that there are some consequences of removal which may be undesirable. These are:

- It will no longer be possible to configure or operate the system in a manner consistent with the NCSC "Orange Book" C2 Security criteria.

- Add-on products for previous SCO UNIX System V releases which perform user authentication will no longer operate correctly. Such products include SCO TCP/IP 1.1.3f, and SCO Xsight 2.2.0e.

- Many security related commands will no longer be available. These include:

  addxusers(ADM),
  ale(ADM),
  ap(ADM),
  asroot(ADM),
  auditcmd(ADM),
  auditd(ADM),
  authck(ADM),
  fixmog(ADM),
  integrity(ADM),
  passwdupd(ADM),
  reduce(ADM),
  rmuser(ADM),
  ttyupd(ADM),
  unretire(ADM)

- Several parts of **sysadmsh**(ADM) will be nonfunctional; the following menu selections will fail:

  System ⇨ Audit (equivalent to auditsh(ADM))
  Accounts ⇨ Terminal
  Accounts ⇨ Report
  Accounts ⇨ Check

- Data entered in forms or fields listed below will be ignored:

  Accounts ⇨ User ⇨ Examine:Audit form
  Accounts ⇨ User ⇨ Examine:Expiration account lifetime field
  Accounts ⇨ User ⇨ Examine:Identity priority field
  Accounts ⇨ User ⇨ Examine:Logins (except administrative lock)
  Accounts ⇨ User ⇨ Examine:Passwords (except changing password)
  Accounts ⇨ User ⇨ Examine:Privileges
  Accounts ⇨ User ⇨ Create type field
  Accounts ⇨ Defaults ⇨ Authorizations
  Accounts ⇨ Defaults ⇨ Password (except minimum change time, expiration time, lifetime and password required to login)
  Accounts ⇨ Defaults ⇨ Logins
  Accounts ⇨ Defaults ⇨ System

  Users will not have individual kernel and subsystem authorizations. This means that most system administration tasks (such as backups, user administration) must be done from the root account, or from another account with uid 0.

- The **relax**(ADM) command will fail.

- It is not possible to reliably regenerate the removed security database files if they are needed later. Freshly installing the operating system is recommended in this case, or recovering the removed files from a backup, and running the **authck**(ADM) command.

The procedure for removing the security database files is as follows:

1. Take the system into single user system maintenance mode.

2. Set the system to the low security defaults by entering:

   /etc/relax low

3. Create a file */etc/default/security*, and add the line:

   ```
   TCBFILES=OFF
   ```

   The file */etc/default/security* should be readable by all users.

4. Remove the line:

   ```
   sdd:2:respawn:/tcb/files/no_luid/sdd
   ```

   from the */etc/inittab* file (and from */etc/conf/cf.d/init.base* if you have installed the Link Kit).

5. Remove the directories containing the security database files by entering:

   rm -rf /tcb /etc/auth

6. Return the system to multiuser mode.

Chapter 5

Administering your system

This chapter discusses aspects of system administration.

Adding a serial card at a non-standard address or interrupt

If you intend to add a serial card at a non-standard address or interrupt (that is, an address or interrupt that is not an option presented by **mkdev serial**), you must follow these steps:

1. If you have already added a line to */etc/conf/sdevice.d/sio* or run **mkdev serial** to install the card, you must first remove the line that was added to */etc/conf/sdevice.d/sio*.

2. Add the new line to */etc/conf/pack.d/sio/space.c*. Do *not* change an existing line. When you enter */etc/conf/pack.d/sio/space.c*, you will see that boards are grouped in sections by architecture. You should add the new line to the correct section. For AT and EISA buses, the line should be added immediately *before* the line that says:

   ```
   {-1,    ~MC},  /* Boards for Micro Channel Architecture */
   ```

   For MCA buses, you should add the line immediately *before* the lines:

   ```
   /* END SIO BOARDS */
   {-1,    MC}
   };
   ```

3. Run **mkdev serial**.

Altering default colors for sysadmsh(ADM) and custom(ADM)

sysadmsh(ADM) and **custom**(ADM) are supplied with a default color scheme. If you want to alter the default colors, see the **sysadmcolor**(ADM) manual page.

Using and disabling #! support

If you have a shell script which must be interpreted by a particular shell, you can use #! to make it happen. #! is turned on by default on your system. The following two sections explain how to disable #! support and how to use #!.

Disabling #! support

Follow this procedure to disable #! support:

1. Change directory to */etc/conf/pack.d/kernel*

2. Edit *space.c* and locate the line:

   ```
   int    hashplingenable = 1;
   ```

   Set the value of **hashplingenable** to 0; after changing the value, the line should look like this:

   ```
   int    hashplingenable = 0;
   ```

   Save the changed *space.c*.

3. Execute **/etc/conf/cf.d/link_unix**

4. Reboot the system.

Using #! support in executable shell scripts

To use the #! feature, you simply enter, as the first line in a script, a line with the following syntax:

   ```
   #! interpreter flag
   ```

where *interpreter* is the absolute pathname of the executable binary that will execute the script, and *flag* is an optional flag to the *interpreter*. In the following example, the user has written a script that should be executed by the Korn shell. The first line of the script is:

   ```
   #! /bin/ksh -x
   ```

Installing IBM dual asynchronous cards

If you want to install one, two or three IBM dual asynchronous cards, you should run the command **mkdev serial**, and select option 5, 8-port card.

Installing a keyboard mouse

Some models of keyboard mice have been reported to track poorly on particularly fast machines. The time required for the mouse driver to detect interrupts depends on the particular hardware being used. In this release, this is now self-configuring to a maximum value of 0x400. If you do not want it to do this dynamic configuration, you can lower the maximum value to what you want by editing the values of **KBM_POLL** and **KBM_POLL_MAX** to be identical in the file */etc/conf/pack.d/kbmouse/space.c*. The value of **KBM_POLL** ranges from 0x20 to 0x400. You should then relink the kernel by entering:

cd /etc/conf/cf.d
./link_unix

Finally, you should reboot the kernel.

Shared library compatibility

There is a discrepancy between the network services shared library distributed with SCO UNIX System V and other UNIX Systems. Programs compiled using the network services shared library from other UNIX Systems will not work under SCO UNIX System V and vice versa. To solve this problem, two sets of the shared library are supplied. The shell script */usr/bin/fixshlib* can alter an imported binary to call the alternate shared library rather than the default SCO shared library. The script is invoked as follows:

fixshlib *progname*

where *progname* is the name of the imported UNIX binary. The program then uses the alternate network services shared library.

Using the 8-bit character set

To use 8-bit character sets and have them recognized by UNIX utilities, you must configure the 8859 character set in the file */etc/default/lang*. For example, to specify US English, you would change the existing line to appear as follows:

```
LANG=english_us.8859
```

The default setting of **ASCII** configures the standard 7-bit character set. Individual users can also set the **LANG** variable in their *.profile* or *.cshrc* files. See **locale**(M) and **environ**(M) for more information.

This release includes the Multichannel Memorandum Distribution Facility (MMDFII b, update #43) as a mail router. The operating system uses MMDF to route mail locally and over Micnet, UUCP, or other networks that provide MMDF support.

NOTE If you only use local mail, (that is, just on your one machine) then MMDF is automatically configured. When the system is installed, you are prompted to provide a name for your machine. Legal names consist of a maximum of 15 lowercase letters, numbers, hyphens, or underscores. 8-bit characters are not allowed. However, if you are connecting to another machine using UUCP, you should limit your machine name to a maximum of 7 characters. UUCP insists that machine names should be unique in the first 7 characters.

If you wish to configure networking or import alias and routing tables, you must read the "Setting up electronic mail" chapter of the *System Administrator's Guide* for instructions.

Known limitations

The following are known problems with MMDF:

- Global aliases are limited in size. The RHS (Right Hand Side) of a global alias (one defined in *alias.user* and *alias.list* in */usr/mmdf/table*) cannot exceed approximately 8 Kbytes when fully expanded. For University of Delaware MMDF, the limit is 512 bytes. An exception to this limitation is included files for which there is no limit.

- The first time the system goes to init level 2, the system name used is *scosysv* instead of whatever was defined at install time. When the system is rebooted, the new name is used subsequently.

MMDF, host names and the underscore character

SCO MMDF, and MMDF in general, allow host names to contain underscore characters; this is an extension of internet standards. To ensure interoperability with hosts that strictly conform to internet standards, we recommend that you do not use the underscore character when internetworking is a primary goal.

UUCP command lines

UUCP running on SCO UNIX System V will only accept command lines of less than 1024 characters. However, a command line can be up to 2048 characters when using UUCP to call from a non-SCO system.

Floating-point emulation

Two floating-point emulators are provided in the product. The default emulator, called **/etc/emulator.ms**, is linked to **/etc/emulator**. Also supported is the AT&T emulator.

Booting old kernels

If you have installed SCO UNIX System V Release 3.2 Operating System Version 4.2, and you attempt to boot a kernel from a previous release (that is, Versions 2.0 or 2.1), you may find that the old kernel will not boot and that the system hangs. If this occurs, you should include the *boot* option, **mem=/L** in the bootstring. The following example illustrates the point:

```
boot
: hd(40)unix.v2 mem=/L
```

boot(ADM) and mem= on Corollary architecture

boot(ADM) will not support **mem=** on Corollary architecture.

Booting on EISA machines

On some EISA machines, the boot procedure will report a different amount of memory from that which is reported by the computer's memory sizing diagnostics. This surplus of memory is detected during **/boot** and kernel initialization. If **/boot** is used with the **mem=/p** option, it will also report the excess memory, which will always be marked as "special" (/s). The kernel does not actually use this "special" memory and so there are no side effects.

Console display problems when booting

When booting up, if the console screen blanks, the cursor is gone, or the display is garbled, you may have an incompatible video card. Check the *Hardware Compatibility Handbook* for a list of supported video cards and monitors. If your video card is not listed, but is identical to (compatible with) one listed in the handbook, it should work.

If the card does not work, check the card hardware documentation. See if there are ways to configure the switch settings so the card is in an IBM-compatible emulation mode, and that it is addressing the kind of monitor attached. In particular, disable "autoswitch" modes. If changing the switch settings fails, then your monitor card is incompatible and must be replaced with a compatible card.

NOTE Due to firmware problems with some older 16-bit VGA cards, it is necessary to place (certain) old 16-bit cards into an 8-bit slot.

Console selection when booting

You can select a video card as the system console at boot time by entering:

systty=cn

or place the keyword **systty=cn** in the file */etc/default/boot*. If you want to select COM1 (tty1a) as the console with 9600bps and no parity, you should enter:

systty=sio

Other options are available — see the **boot**(HW) manual page.

Modifying a printer's lpi value

To modify the value of the **lpi** parameter, run **sysadmsh** and select the following sequence of options: Sysadmsh ⇨ Printers ⇨ Configure ⇨ Parameters. To alter the value of the **lpi**, a value must already exist. If a value does not exist, the following message will be displayed:

```
UX:lp: error the following option cannot be handled
```

When you use **sysadmsh** to alter the value of the printer parameter **lpi**, **lpi** must already have a value.

The tape format command

The **tape format** command only applies to floppy diskette controller-based tape drives, namely the Irwin and QIC-40/QIC-80 tape drives. You must bulk-erase tapes before using the **tape format** command to re-format them. This means that if a tape has been format-written before, you must erase it with a bulk eraser before you can format-write it again. (See **tape**(C) for more information.) If the **tape format** command fails, the drive light flashes rapidly. The user must reset the drive by removing the tape cartridge. The driver does not detect this condition and no error message is generated. All tape operations fail until the tape is removed and reinserted.

Removing the Link Kit

If you are planning to remove the Link Kit, you should be aware that it will need to be reinstalled if you add additional devices to the system, or if you retune a kernel parameter.

10-bit I/O addressing check

The operating system detects machines that have only 10-bit I/O addressing. This message is displayed at boot time:

```
kernel: INFO: 10 bits of I/O address decoding
```

Such machines cannot use bus cards at addresses above 0x400. Card addresses must be below 0x400 on machines with only 10 bits of I/O address decoding.

MPX

If MPX is to be installed on this release, MPX version 3.0 or later must be used.

System security and DOS-under-UNIX system

SCO UNIX System V is designed to meet the requirements of the C2 level of "trust" as defined by the NCSC *Trusted Computer System Evaluation Criteria*. This means that all accesses of subjects (processes) to objects (files and devices) are subject to Discretionary Access Controls (DAC) and auditing.

DOS-under-UNIX system operations (such as those used in SCO VP/ix or SCO Open Desktop / SCO Open Server) require special privileges that are accessed using the **v86init**( ) system call. This system call has the potential to bypass DAC and auditing in certain cases, although this does not affect normal use of the system because it can only be issued by a process either run directly from the *root* login or installed as **setuid** *root*.

When you install a product such as VP/ix, you install some **setuid** *root* commands that issue the **v86init**( ) system call. MS-DOS programs controlled by the emulation process, unlike those associated with SCO UNIX System V, have not been modified to satisfy the C2 requirements. Thus, a system with this software installed does not adhere to the C2 guidelines.

Restoring user accounts from Version 2.x to Version 4.2 and later of the operating system

After performing a fresh installation of Release 3.2v4.2 of the operating system, (that is, if you choose not to perform an Upgrade Installation), user accounts may be restored from a previous Version 2.x backup.

The **ap**(ADM) command has been extended to include two additional options, **-u**, and **-g**. The **-u** option allows account profiles from earlier SCO UNIX systems to be restored. The **-g** option causes **ap** to include group membership in the account profile information output. When restoring and updating, if group membership information is available, **ap** processes it automatically.

An amended version of **ap** is supplied online as part of this release. To restore users from a Version 2.0 backup, follow the instructions below.

> **NOTE** This procedure can only be carried out by the super user, or by a user having the **auth** subsystem authorization, and both the **chown** and **execsuid** kernel authorizations.

1. Back up the home directories of the users on the earlier system, using **cpio** or **tar**. (Do not back up these files using absolute pathnames. For example, if your accounts are in /usr, run your backup command from that directory, not from /.)

2. Make a copy of /etc/passwd, /etc/group, and /tcb/files/auth from the earlier system. For example, to archive the required files into the file accnt_file, type:

   cd /
   tar cf accnt_file etc/passwd etc/group tcb/files/auth

   > **NOTE** These files are not backed up with absolute pathnames.

3. On the new system, create a directory, change to the new directory and extract the saved files into it. Take care not to overwrite the /etc/passwd and /etc/group files on the new system. For example, to extract the files from accnt_file type:

   mkdir /tmp/old_accnts
   cd /tmp/old_accnts
   tar xf accnt_file

   The new directory should now contain the directories *etc* and *tcb*.

4. Edit the *passwd* file from the earlier system, to reflect the new location of the users' home directories (if these are different).

5. Run the **ap** command, as shown below, to update the system profile files with the new entries:

   /tcb/bin/ap -vu `pwd`

   This will not overwrite existing entries; a warning message will be issued instead.

6. Restore the users' home directories to the desired location with their original permissions.

Reducing interrupt trigger level to stop data loss with FIFO buffers

For serial adapters that use chips with FIFO buffers which allow 16-byte buffering of characters, it is possible to lose characters if the interrupt routine dispatch time is slow. By default, the interrupt trigger level is set to fourteen. If this trigger level is not correctly set, data will be lost as incoming data will overwrite data which is still waiting to be transferred out.

You can detect if you are losing data by executing **sar**(ADM) with the **-g** option. **sar -g** detects chip overflows and displays error messages appropriately. A 0 error code means no overflow errors detected. If overflow errors are detected, you should lower the trigger level to give the interrupt routine more time to respond. The lower the trigger level, the better the chance of copying out the characters before an overflow occurs in the adapter. This inherently reduces your buffering capacity.

This trigger level can be set in the file */etc/conf/pack.d/sio/space.c*. One line appears for each minor device of the "sio" driver. Edit the appropriate line (determined by examining the minor number of the device node you wish to affect). Substitute the symbols **FCR_Rx1**, **FCR_Rx4**, **FCR_Rx8** or **FCR_Rx14** to set the trigger level respectively. A lower trigger level gives the kernel more time to handle the interrupt before further incoming characters may be lost, but increases the overall interrupt burden on the CPU. Do not change the format or number of lines since the script */usr/lib/mkdev/serial* depends on the format of this file.

Slow performance due to insufficient cache

Most motherboards which have external (motherboard) cache require a certain amount of cache to correspond to system memory. For instance, in the most typical design, 64Kbytes of cache are required for each 16Mbytes of RAM.

If the system has more RAM than its cache can handle, it generates a signal whenever memory outside the cachable area is accessed. This signal tells the motherboard cache not to pay attention to this particular memory access.

On most motherboards, this same signal causes the Intel 486 or Pentium internal cache to ignore that memory access. The result is that memory below a certain address is cached by both the internal and external caches, while memory above that address is not cached at all. This causes a striking difference in performance; up to a factor of eleven in certain tests. This problem is sometimes referred to as "anti-caching".

If you suspect this problem, enter the following shell script (save it as */tmp/times.sh*):

```
:
while :
do
    set `timex sh -c 'echo "for (i = 0; i < 10000; i++)" | nice -2 bc' 2>&1`
    echo "`date` real=$2 user=$4 sys=$6"
done | tee /tmp/times.log
```

Run it for several hours while your system is being used for various normal tasks. If the longest "user" time is more than 1.5 times the shortest "user" time, your system probably has this problem. (It is normal for "real" time to vary a great deal).

If running the script shows the problem, take the following steps:

1. Check BIOS setup. Many BIOS's can be set to cache only part of memory. Some are configured that way from the factory. The BIOS should normally be set to allow caching of all of main memory.

2. Check system or motherboard documentation, or contact the hardware manufacturer. Make sure you have enough cache for your RAM. If you are unsure and cannot find the necessary information, upgrade the motherboard to the maximum amount of cache it supports. Having extra cache will not degrade performance.

3. While waiting for a cache upgrade to be installed, the problem may in some cases be partially alleviated by loading the operating system kernel entirely within the first 16MBytes of memory. To do this, add the string "mem=/L" to the end of the **DEFBOOTSTR** entry in */etc/default/boot*. You can also do this for a single boot session by entering it at the "Boot:" prompt as follows:

Boot
: defbootstr mem=/L

4. Alternatively, you could temporarily restrict your system to only use memory which is cachable by the currently installed cache. For instance, if the system has 64MBytes RAM and 128Kbytes cache, it is likely that only the first 32MBytes is cachable. Until upgrade hardware arrives, you could set the system to use only the first 32MBytes of RAM:

   Boot
   : defbootstr mem=1m-32m

   See **boot**(HW) for more information about "boot" keywords.

Creating your emergency boot floppy set

Step 20 of the "Creating an emergency boot floppy set" chapter of the *Installation Guide* instructs you to write-protect your *root* filesystem floppy disk.

Omit this step as the system needs write-access to this disk.

Chapter 6
Using your system

Job control and programs that ignore it

If you run a program under the Korn shell (ksh) with job control set, there is a possibility that the program may not work properly. This is because the underlying code might not obey the job control specification (for example, the command **stty icanon &** would fail). If this occurs, simply disengage job control with the following command:

> **set +m**

The program should then execute normally.

Job control and screen redraw problems

Because most programs do not take job control into consideration, (**vi**(C), **sysadmsh**(ADM) and **custom**(ADM) are exceptions), the screen is not redrawn when the program is brought back into the foreground. When a screen-based application (one using the **curses** library) is placed in the background, bringing it into the foreground could result in a blank screen. When the screen is redrawn, the application should function properly. Many applications will redraw the screen if you type <Ctrl>r, or sometimes <Ctrl>l.

ksh and shutdown(ADM)

If you attempt to run **shutdown su** from within **ksh**, the system will hang (freeze). The workaround is to start a Bourne shell first and then run the command.

Scancode mode

Modems do not understand scancodes. Do not enable scancode mode on a port communicating with a modem while attempting to dial.

Running applications on scancode terminals

SCO UNIX System V supports terminals, such as the Wyse 60 and the HP 700/44, which have a "PC-compatible" (scancode) mode. There are some points to note when running certain applications, or combinations of applications and utilities, on serial terminals in PC-compatible mode.

mscreen

The SCO **mscreen**(M) (terminal multiscreen) utility can be used on scancode-compatible serial terminals, but you should note that when it is used on a Wyse 60 terminal, the screen must be refreshed after a screen switch. This is because the Wyse 60 does not support hardware page switching when in PC-compatible mode.

You should also note that when running under **mscreen**, although the terminal itself may be in scancode mode, the login sessions are running on pseudo-ttys, which receive ASCII data from the **mscreen** utility. The effect of this is that applications that normally run in scancode mode, such as Microsoft Word, will actually start up in ASCII mode.

Telnet and rlogin

Telnet or rlogin sessions to a remote host also transfer ASCII data via a pseudo-tty, even if the physical terminal or the console in use is in scancode mode.

usemouse(C)

The **usemouse**(C) utility can normally be used on a serial terminal in scancode mode, using the same default map file or application-specific map files (in */usr/lib/mouse*) as the console. Note, however, that when running on a Wyse 60 terminal in PC-TERM mode, the map files used should be the same as those used when running on a Wyse 60 in native mode.

Notes on using the console keyboard in AT mode

If your console keyboard hardware supports AT (Code-set 2) mode, you can switch between XT and AT mode using **kbmode**(ADM). Note however that some applications do not support this mode:

Microsoft Word

Word works in XT mode only and explicitly places the console keyboard in XT mode when it starts. This means that if Word is running on a console multiscreen, all of the other multiscreens will also be placed in XT mode. The keyboard should not be switched to AT mode on another multiscreen whilst Word is running, since this will cause Word to stop recognizing keystrokes, including screen switch keystrokes.

SCO Xsight RTS

The SCO Xsight server does not support AT scancodes. Xsight and ODT should not be started with the keyboard in AT mode, and the keyboard should not be switched to AT mode while Xsight is running on another multiscreen.

Also, both SCO VP/ix and SCO Merge do not support this mode.

Encryption software availability

The **crypt**(C) command and libraries are not distributed with the SCO UNIX System V Operating System or Development System. Although the documentation is included, the distribution of encryption software to sites outside the United States is restricted by the United States government. If you require the **crypt**(C) utility and associated **crypt**(S) libraries, and you are located within the United States, contact the support center listed on the support information card included with the software. A subset of **crypt**(C) without decryption is available for use outside the United States.

quot(C)

The **quot**(C) command does not work for users at this time. It can only be run by the super user.

file(C)

The ability to identify 8-bit text is not yet available.

mail(C)

mail has only been partially internationalized; it does not accept 8-bit characters in user names.

Numeric keypad problems

Occasionally, the numeric keypad may operate as if NumLock is on when it is actually off or vice-versa. If you encounter this problem, quickly toggling the NumLock key a few times and hitting each of the left and right Shift keys a couple of times should correct it.

Using the dd(C) command with Exabyte tapes

Do not use the **dd** command to put individual data files onto Exabyte tapes; extracting the files may cause extraneous characters to be appended to the original data. You can, however, use the **dd** command with Exabyte tapes to store and extract **tar**(C) or **cpio**(C) images.

SCO Xsight Release 2.2.0 Supplement diskette

Older versions of SCO Xsight Release 2.2.0 contain a Supplement diskette which was required for SCO UNIX System V Release 3.2 Operating System installations. You must not install this Supplement diskette on this release of SCO UNIX System V. This diskette contains older utilities and configuration files which, if installed, will lead to problems with these utilities as well as with other operating system utilities. The files that are overwritten by the Supplement diskette include:

/usr/bin/compress
/usr/bin/tar
/etc/termcap
/usr/lib/mkdev/mouse

If this diskette is accidentally installed, you must first reinstall the **compress** utility. You can use **custom**(ADM) to do this. After reinstalling the **compress** utility, you must reinstall the remaining three files.

/etc/shadow and VP/ix vpixadm (ADM)

Removing the */etc/shadow* file before installing VP/ix allows *vpixadm* to be run to add VP/ix users. This causes the encrypted password strings to be moved from */etc/shadow* to */etc/passwd*. However, if you prefer passwords not to be stored in */etc/passwd* because of the associated reduction in security, you can do one of the following:

- Edit the *vpixadm* script, to remove the test for a single " x " character in the encrypted password field of */etc/passwd*. (There are two instances of this in the *vpixadm* script.) For example, change:

  grep "${_uname}:x:" /etc/passwd /dev/null 2&1 && {

  to:

  grep "${_uname}:P:" /etc/passwd /dev/null 2&1 && {

- Whenever you add a user:
  1. Take the system into single user mode.
  2. Use **pwunconv**(ADM) to remove */etc/shadow*.
  3. Use **vpixadm** to add the user.
  4. Recreate */etc/shadow* using **pwconv**(ADM).
  5. Take the system into multiuser mode.

| **NOTE**   This problem is fixed with Support Level Supplement app342.

Chapter 7

Compatibility and conformance notes

This chapter contains information about compatibility with other UNIX operating system and XENIX releases, including conformance to industry standards.

Security standards conformance

The security features present in this release are extensions to UNIX System V and are designed to meet the requirements of the "Class C2 Controlled Access Protection" rating as specified in the following security standards:

- DhH 5200.28-STD "Department of Defense Trusted Computer System Evaluation Criteria" (also known as the "Orange Book").

- TD-85-02 "Department of the Treasury Handbook for Automated Information Systems Security and Risk Management, April 1987."

In addition, password management facilities are present that are designed to meet the following standards:

- CSC-STD-002-85 "Department of Defense Password Management Guideline" (also known as the "Green Book").

- FIPS PUB 112 "Password Usage" (a superset of the requirements described in the "Green Book").

SCO UNIX System V provides full binary and source code compatibility with applications developed for XENIX System V/386, XENIX System V/286, UNIX System V/386 and UNIX System V/286. This support does not extend to device drivers, however. The following list describes the level of XENIX System V support:

- Source code written for XENIX System V/386 can be compiled and linked on UNIX System V/386 without having to modify the source code.

- Binary applications developed for XENIX System V/386 (Release 2.2 and later), XENIX System V/286 (Release 2.0 and later), and XENIX System V/8086 (Release 2.0 and later) can be run on UNIX System V/386 without having to recompile the applications.

- The structure of the UNIX System V/386 filesystem allows both XENIX System V and UNIX System V binary applications to be executed. It also supports the mounting of XENIX and UNIX removable filesystems.

- Support for XENIX system call extensions enables programs to run as they did under the XENIX system.

- All device driver support routines available under XENIX System V/386 are available in UNIX System V/386.

Differing system calls

The following XENIX system calls are supported in SCO UNIX System V but function differently:

ptrace( )
In SCO UNIX System V the **ptrace( )** system call is not supported for XENIX system binaries. XENIX system binaries that rely on **ptrace** do not work on SCO UNIX System V. To make their code run on SCO UNIX System V, you must modify their XENIX system code to use the UNIX system version of **ptrace**.

ulimit( )
XENIX System V/386 binaries that call **ulimit( )** with the cmd argument set to 2 cannot increase their limit beyond the maximum number of blocks that are representable in a 512-byte block filesystem. This restriction is not enforced when the source is compiled on SCO UNIX System V.

uname( )
The **utsname** structure returned from **uname( )** is a different size, depending on whether you compile on XENIX System V/386 or on SCO UNIX System V. On XENIX System V/386, there are extra fields at the end of the structure.

AT&T SVID2 conformance

The AT&T System V Interface Definition version 2 (SVID2) is a three-volume set of books published by AT&T (select code 307-127). SCO UNIX System V was tested against the AT&T SVVS3 (System V Verification Suite) tests, and the conformance was verified.

POSIX P1003 conformance

The referenced standard is published by the IEEE. SCO UNIX System V conforms to the POSIX P1003.1 Operating System Interface Specification with only minor exceptions.

FIPS PUB 151-1

SCO UNIX System V fully conforms to the FIPS PUB 151-1 requirements.

The ISO 8859 character set

The operating system can handle all programs using the ISO 8859 character sets. It provides full 8-bit support and is configurable for 7- and 8-bit peripherals with different character sets, including mapping files and conversion tools.

X/Open CAE conformance

This SCO UNIX System V product has been branded as conforming to the X/Open Company Ltd Portability Guide version 3 (XPG3). In accordance with X/Open trademark requirements the complete system that was tested was as follows:

SCO UNIX System V/386 Release 3.2 Operating System Version 4.2
SCO UNIX System V/386 Release 3.2 Development System Version 4.2

on 386/486 PCs, ISA Bus and IBM PS/2 386/486 MC and compatibles.

The SCO UNIX System V operating system contained in this box is branded as a runtime subset of the full system certified as X/Open conformant. If the application you are intending to run requires a complete X/Open Conformant environment then you would need to install the SCO UNIX System V Release 3.2 Development System Version 4.2 to provide a system which includes the C language and is fully conformant to the (base) profile of X/Open.

When this operating system, and its associated development system, are installed on an industry standard microcomputer, based on an Intel 386, or 486 chip and using either an ISA or MicroChannel bus, then the resultant system is capable of passing the X/Open Verification Suite (VSX) Release 3. EISA systems are capable of running the ISA version of the product. At this time no EISA-specific implementations of the SCO UNIX System have been tested. Further details of specific machines on which this operating system will successfully run are contained in the *Hardware Compatibility Handbook*.

What is X/Open and what does X/Open mean to you?

X/Open is an international organization made up of suppliers and users of information systems who are committed to the establishment of worldwide standards for computing. It is not a standards creation body, but is involved in the practical adoption of standards, both formal and defacto, that already exist. X/Open's goal is to make sense of these standards for the benefit of the organizations that use them.

X/Open include these standards into specifications known as the Common Application Environment (CAE).

The CAE provides a source-level set of standards which an application developer can rely on to ensure easy portability and consistent functionality of the application. The CAE is defined by a document known as the X/Open Portability Guide (XPG3).

What does X/Open conformance mean?

Software developers are increasingly demanding strict compliance to interface standards in order to minimize the cost of providing and maintaining their products on multiple platforms.

X/Open has responded to that requirement by implementing an independent system of product testing that gives the best possible assurance of standards compliance. This procedure is called "XPG3 Branding," the X/Open "Brand" or trademark being awarded only when all the quality and test criteria are met.

The SCO UNIX System V Operating System is X/Open branded, signifying that it fully meets X/Open's criteria.

A comprehensive set of tests, the X/Open Verification Suite (VSX), has been developed by X/Open in order to ensure that claims of conformance to these standards can be substantiated.

X/Open has defined a number of "profiles" which are sets of X/Open-specified services useful to an applications developer. There are two major profiles, BASE, which includes the basic internationalised operating system, commands and utilities, and PLUS, which includes other facilities such as SQL, ISAM, COBOL and FORTRAN: it is to the BASE Profile that SCO UNIX System V Release 3.2 Operating System Version 4.2 conforms.

Benefits to the developer

What this means for the applications developer is a source-level standard on which they can rely, and therefore easier portability of application software from one operating environment to another.

Benefits to the user

What this means for the user is wider availability of applications for X/Open-Conformant systems and the assurance of consistent behavior of applications when run on dissimilar systems provided both systems are X/Open-Conformant. Many commercial, National, International and Federal organisations are requiring conformance to the X/Open standard as part of their procurement specifications.

SCO is fully committed to the X/Open standard and the X/Open standards setting process, and actively participates in it.

iBCS Edition 2 conformance

SCO UNIX System V Release 3.2 Operating System Version 4.2 conforms to the Intel Binary Compatibility Standard Edition 2. This means that binary applications built on SCO UNIX System V will run on any computers based on the Intel $x86$ instruction sets when executing on an iBCS2 conformant operating system.

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Volume title: _____
(Copy this from the title page of the manual, for example, SCO UNIX Operating System User's Guide)

Product:_____
(for example, SCO UNIX System V Release 3.2 Operating System Version 4.0)

How long have you used this product?

❑ Less than one month ❑ Less than six months ❑ Less than one year

❑ 1 to 2 years ❑ More than 2 years

How much have you read of this manual?

❑ Entire manual ❑ Specific chapters ❑ Used only for reference

	Agree				*Disagree*
The software was fully and accurately described	❑	❑	❑	❑	❑
The manual was well organized	❑	❑	❑	❑	❑
The writing was at an appropriate technical level (neither too complicated nor too simple)	❑	❑	❑	❑	❑
It was easy to find the information I was looking for	❑	❑	❑	❑	❑
Examples were clear and easy to follow	❑	❑	❑	❑	❑
Illustrations added to my understanding of the software	❑	❑	❑	❑	❑
I liked the page design of the manual	❑	❑	❑	❑	❑

If you have specific comments or if you have found specific inaccuracies, please report these on the back of this form or on a separate sheet of paper. In the case of inaccuracies, please list the relevant page number.

May we contact you further about how to improve SCO UNIX documentation? If so, please supply the following details:

Name _____ *Position* _____

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