

SCO® UNIX®
Operating System

Version 4.0
Release Notes



SCO[®] UNIX[®] Operating System

**Version 4.0
Release Notes**



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Chapter 1

Introduction

This document contains important information about the SCO UNIX System V/386 Release 3.2 Operating System Version 4.0. It is divided into two parts: Release Notes and Appendix A, "Compatible hardware."

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

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 4.0. 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.

Also, please note that certain hardware configuration information included in Appendix A of these notes may be required for successful installation. You should refer to those sections of Appendix A that apply to the hardware in your configuration if you have trouble installing the operating system.

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.

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 4.0 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-B3
- 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 4.0 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

CD-ROM distribution

This release sees the first distribution of SCO UNIX System V on 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**.

The packages in the SCO UNIX System V Operating System are listed below. The sizes are in 512 byte blocks. Please note that this is a sample listing only. The actual sizes of the packages in your set may differ from those shown here. Use **custom(ADM)** to determine the actual sizes in your set.

NOTE It is 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 of disk space. In addition, you will need a minimum of 2Mb of RAM. These are minimum figures; we recommend that you have 80Mb of hard disk and 4Mb of RAM.

UNIX System V Operating System Packages

Package	Size (512 byte blocks)	Use/Contents
RTS	21432	UNIX Run Time System
ALL	33962	Entire Extended Utilities (includes all of the following)
AIO	48	Asynchronous raw I/O administration
BACKUP	272	System backup and recovery tools
BASE	1106	Basic extended utility set
CSH	132	The C shell
DIAL	170	High speed Modem Dialers for UUCP
DOS	384	DOS utilities
FILE	320	File manipulation tools
GAMES**	3750	Entire games package
KSH	254	The Korn shell
LAYERS	128	System V Layers
LINK	8946	System V Link Kit files
LPR	2370	Multiple line printer spooler
MAIL	6990	Electronic mail and micnet
MAN	2856	Operating System Manual Pages
MOUSE	172	Mouse and graphic input devices files
NETCFG	94	Netconfig
OAMPKG	1802	Office automation and maintenance package
SCOSH	3416	SCO Shell
SYSADM	726	Additional system administration tools
TPLOT	134	tplot , graph , and spline
UUCP*	2442	uucp and cu communications utilities
VI	426	The vi and ex editors
VIDEO	570	Video Graphics configuration

* The SCO UNIX System V Release 3.2 Operating System Version 4.0 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.

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, <code>cs</code> h 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 <code>mkdev layers</code> , 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 the MICNET mail routing system, that 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 System V 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 *Documentation 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 2

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 page 13.
- 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 page 12.
- If you plan to use the update option, and you are using a non-SCO driver as your root disk controller, see page 12.
- 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 page 14.
- There is a minor addition to chapter 2 step 38 of the *Installation Guide*. See page 15.
- If you plan to install SCO UNIX System V from a serial console, see page 23.
- During installation, should you see a message indicating that you have insufficient disk space, see page 23.
- If you plan to install TCP/IP Release 1.1.3f, see page 24.
- If you plan to install SCO NFS 1.1 or the SCO NFS maintenance supplement, see page 25.
- If you plan to install the SCO UNIX System V Development System Release 3.2.0, see page 25.
- If you plan to install SCO Portfolio Version 1.0.1, see page 26.
- If you plan to install SCO Xsight, see page 27.

- If you plan to install SCO VP/ix, see page 28.
- If you plan to add a serial card at a non-standard address, see page 47.
- If you plan to add or configure parallel ports, see page 48.
- If you want to enable or use `#!` support, a new feature in SCO UNIX System V, see page 49.
- If you plan to install between 1 and 3 IBM dual asynchronous cards, see page 49.
- If you plan to use 8-bit character sets and have them recognized by UNIX utilities, see page 50.
- If you experience poor tracking of a keyboard mouse, see "Installing a PS/2 keyboard mouse" on page 49.
- The section "MMDf mail router" discusses known limitations with MMDf. See "Known limitations" on page 51.
- If you attempt to boot a kernel from a previous release, you may encounter problems. See "Booting old kernels" on page 52.
- `boot(ADM)` will not support `mem=` on Corollary architecture. See page 52.
- If you are booting on EISA machines, see page 52.
- If you are thinking of tuning kernel parameters, you should see page 52 as well as consulting the *System Administrator's Guide*.
- If you encounter console display problems when booting, see "Console selection when booting" on page 53.
- If you are thinking of changing a printer's `lpi` value, see page 54.
- If you are thinking of removing the Link Kit, see "Removing the Link Kit" on page 54.
- If you are running MS-DOS under SCO UNIX System V, you should read the "System security and DOS-under-UNIX system" note on page 55.
- If you plan to install MPX on this release, you must use version 2.0 or a later version. See page 55.
- If you intend to use `mkdev hd` to configure a host adapter, see page 55.
- If remapping of bad sectors is an issue, see page 56.
- If you are located in the United States and require the `crypt(C)` software, see "Encryption software availability" on page 59.
- If you have a port enabled for scancode mode, you will not be able to dial out on that line unless you have a scancode modem. This and other scan-code notes are discussed on page 58.
- If you have problems with the numeric keypad, see page 60.

Chapter 3

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 4.0.

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 4.0. Users of earlier releases of SCO UNIX System V must reinstall from scratch by using the “Fresh” install option in the installation procedure.

In addition, the update will only update standard operating system software. It will not update add-on packages such as most versions of TCP/IP and NFS (TCP/IP Release 1.1.3f and NFS Release 1.1.1d are exceptions). 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 4.0, and will need to be reinstalled if they are still required. If you have TCP/IP Release 1.1.3f or NFS Release 1.1.1d, they will be retained when you update. If you plan to install TCP/IP 1.1.3f after updating or using the “Fresh” install option, see the section in this chapter entitled: “If you plan to install TCP/IP Release 1.1.3f” for further information.

Note that you will need a minimum of 10Mbytes of unused disk space to use the Update. In addition, you will need a minimum of 2Mb 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 4.0 is not intended to work on an SCO Open Desktop (ODT) system.

For more information on the update package, see the chapter entitled “New features and enhancements in this release” 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 CONTROL-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**.

2. Edit the file, `/etc/conf/cf.d/m SCSI`, to change the the host adapter code to a code recognised by SCO UNIX System V Release 3.2 Operating System Version 4.0. 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 tmc-1660, tmc-1680, MCS-700 (1800 chip)
hf	IBM Hard File
spad	Adaptec 152x
sumo	Storage Plus SCSI-AT (SUMO)
tmcha	Future Domain tmc-885, tmc-860 (950 chip)
wdex	Western Digital 7000EX
wdha	Western Digital 7000

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

Warning: m SCSI - host adapter 'dptH' not in mdevice

you would need to edit your `/etc/conf/cf.d/m SCSI` 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`

Non-recognition of serial and parallel drivers

With the release of SCO UNIX System V Release 3.2 Operating System Version 4.0, 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 we're 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 multiport cards, memory, and other bus cards" in the *System Administrator's Guide*. The section entitled "Adding and configuring parallel ports" in the "Administering your system" chapter of these release notes contains an erratum to the *System Administrator's Guide*.

Disabling AT mode

Before installing SCO UNIX System V Release 3.2 Operating System Version 4.0 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.

Installation guide addendum

In the *Installation guide*, at step 38 of chapter 2, you are given the option to run the system administration shell (**sysadmsh**). If you select this option, you must *not* try to do anything other than add users, configure the system or change system defaults. If you try to do anything else at this stage in the installation, (for example, install more software), the kernel may run out of processes

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/386 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/386 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 re-define 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 UNIX System V/386 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 tmc-1660, tmc-1680, MCS-700 (1800 chip)
hf	IBM Hard File
spad	Adaptec 152x
sumo	Storage Plus SCSI-AT (SUMO)
tmcha	Future Domain tmc-885, tmc-860 (950 chip)
wdex	Western Digital 7000EX
wdha	Western Digital 7000

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

Stp=fdha(0,0,2)

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

<i>driver</i>	=	host adapter driver prefix
<i>base</i>	=	adapter I/O base address
<i>int</i>	=	adapter interrupt vector
<i>dma</i>	=	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 386 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 will need approximately 10 Mbytes of disk space plus default swap space to maintain the audit record files.

Cartridge tape configuration

If you have the cartridge tape distribution of SCO UNIX System V, you must make certain that your tape drive, whether standard or SCSI, is configured so that SCO UNIX System V can recognize and access it automatically. The configuration requirements for standard architecture machines are as follows:

Cartridge Tape Drive Name	Address	DMA	Interrupt
Standard (Wangtek)	0x0338-0x033C	1	5
Mountain	0x0200-0x0203	1	5
IBM 6157	0x3120-0x312F	2	6
Everex/Archive	0x0300-0x0301	1	3
Tecmar	0x0300-0x0301	3	5

SCSI Cartridge Tape

Host Adapter	0
ID	2
LUN	0

If you do not configure your drive as described above, you must reconfigure the system during installation and restart before continuing the installation. For information on supported hardware, see "Tape drives and controllers" in Appendix A of these notes. For more information on configuring tape drives, see the "Using floppy disks and tape drives" chapter of the *System Administrator's Guide*.

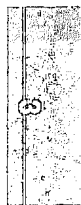
For a SCSI tape installed at non-default settings, see the **Stp=()** boot keyword in the section entitled "Configuring devices at installation or boot time" in this chapter.

Compaq SCSI tape installation

If, during installation, you select Compaq SCSI tape installation, you should note the following issue. 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 20 seconds to complete. If the command takes longer than 45 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

At this time 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 ttyla
disable tty0[1-9] tty1[1-2]
```

3. Then enter the commands:

```
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.

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 plan to install TCP/IP Release 1.1.3f

This note applies if you are installing TCP/IP Release 1.1.3f after installing or updating SCO UNIX System V. This note does not apply to TCP/IP releases later than 1.1.3f. Any release notes that accompany later versions of TCP/IP override this note.

Before you install TCP/IP Release 1.1.3f, you should save the SMTP channel delivery programs prior to installing TCP/IP 1.1.3f. Before installing TCP/IP Release 1.1.3f, enter the following commands:

```
cd /usr/mmdf/chans
cp smtp smtp-
cp smtpd smtpd-
cp smtpsrvr smtpsrvr-
```

Then install TCP/IP Release 1.1.3f. When you have successfully installed TCP/IP Release 1.1.3f, enter the following commands as the user *mmdf*:

```
cd /usr/mmdf/chans
mv smtp- smtp
mv smtpd- smtpd
mv smtpsrvr- smtpsrvr
```

During a kernel relink, during or after installation of TCP/IP Release 1.1.3f on SCO UNIX System V Release 3.2 Operating System Version 4.0, the following message will be displayed:

```
./usr/include/sys/nb/ncb.h: 36: M_I386 redefined
```

The warning is broadcast because *M_I386* is defined in a number of header files. It is purely a warning and has no effect whatsoever on the installation of TCP/IP Release 1.1.3f.

When installing TCP/IP Release 1.1.3f, you should also install the TCP/IP supplement that was provided with it. This supplement is labelled, "for SCO UNIX 3.2v2," but it is also necessary for use with this release of SCO UNIX System V.

If you plan to install NFS 1.1 or the NFS maintenance supplement

If you plan to install NFS 1.1, you should *not* install the NFS maintenance supplement.

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.x or 4.0. 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 file name, 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.

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
```

If you install SCO Xsight

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 4.0 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 pttty**.

SCO UNIX System V Release 3.2 Operating System Version 4.0 no longer contains *grafinfo* files. When installing SCO Xsight Release 2.2.0, the following error message

Grafinfo files are missing

will be displayed when you attempt to select "Update" during the execution of **mkdev graphics**. 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 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.

NOTE 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 pty** (see the *System Administrator's Guide* for instructions on running **mkdev pty**). After running the script, you should then create old-style (BSD name-scheme) device nodes linked to the new device nodes by running **mkdev pty 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 pty xnodes** must be the last utility to be run as part of the process of configuring your system.

If, at a later date, you need to relink your kernel using the link-kit or you run **idmknod** to recreate devices; you must first remove the pty device nodes that were created in the */dev* directory when **mkdev pty xnodes** was run. In addition, using an editor such as **vi**, you must edit the file */usr/lib/event/ttys* to remove the lines that associate pseudo-mice with these nodes. Then, after reconfiguring your system, you must re-run **mkdev pty xnodes**.

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*.

If you install SCO VP/ix

If you intend to install SCO VP/ix, you should first remove */etc/shadow* by using the **pwunconv(ADM)** command. This causes a reduction in security but is necessary if VP/ix is to be installed.

Chapter 4

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 4.0 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 most versions of TCP/IP and NFS (TCP/IP Release 1.1.3f and NFS Release 1.1.1d are exceptions). 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 4.0, and will need to be reinstalled if they are still required. If you have TCP/IP Release 1.1.3f or NFS Release 1.1.1d, they will be retained when you update.

NOTE If you select the update option, you must back up and verify the backup before upgrading to SCO UNIX System V Release 3.2 Operating System Version 4.0.

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 utility, **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.

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 Appendix A.

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.

Long file names

Support for long filenames is introduced with this release. 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.

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 a new option, **-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 **#!** (pronounced hash-pling) to make it happen.

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

DOS partitions

For this release of SCO UNIX System V, DOS support has been enhanced by the following features:

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(>32Mb) from within SCO UNIX System V for DOS 3.x, 4.x and 5.x.
4. The ability to mount DOS partitions as filesystems under SCO UNIX System V.
5. The ability to copy files to and from DOS partitions and list the contents of DOS directories using the DOS utilities, (`doscp(C)`, `dosdir(C)` etc.)

Modifications have been made to the `dos(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 `dos(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**:

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.

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

Hi-speed modem dialer

Hi-speed modem dialer support has been incorporated into SCO UNIX System V Release 3.2 Operating System Version 4.0. 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 the following are listed in the "Modems and autodialing" section of Appendix A of this document.

Pseudo-tty

Pseudo-tty handling has been removed from the **mkdev mouse** script. There is a new **mkdev pty** 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 pty** script is incompatible with pre-Release 3.2 Version 4.0 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 Version 4.0.

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 pty** 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. A full list of supported mice appears in Appendix A of these *Release Notes* in the section entitled "Mice and other graphic input devices."

SCSI subsystem

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 Appendix A for a full listing of supported host adapters.

To implement these enhancements, changes have been made to the **mkdev hd** script - see the *System Administrator's 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: **disk(HW)**, **scsi(HW)**, **boot(HW)** and **mdevice(F)**.

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

Chapter 5

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.

New security features and commands

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."

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.

If you intend to install SCO VP/ix, you should first remove */etc/shadow* by using the **pwunconv(ADM)** command. This causes a reduction in security but is necessary if VP/ix is to be installed.

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).
- **PASLENGTH** 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 1.1.3f, and SCO Xsight 2.2.0e.

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

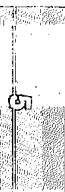
addxusers(ADM),
ale(ADM),
ap(ADM),
asroot(ADM),
auditcmd(ADM),
auditd(ADM),
authck(ADM),
cps(ADM),
fixmog(ADM),
integrity(ADM),
passwdupd(ADM),
reduce(ADM,)
rmuser(ADM,)
ttyupd(ADM),
unretire(ADM)

- 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 multi user mode.



Chapter 6

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`.

Adding and configuring parallel ports

The `mkdev parallel` script has been amended. The effect of this modification is that two screens displayed in the *System Administrator's Guide* section entitled "Adding and configuring parallel ports" have been changed. In step 2 of the section, the displayed screen now also displays a list of the currently configured cards. In step 3, the screen also displays the addresses of the listed ports. In addition, step 3 will prompt you to enter an interrupt vector unless your machine is a Micro Channel machine, in which case an interrupt number of 7 is assumed.

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.

Enabling and using `#!` support

If you have a shell script which must be interpreted by a particular shell, you can use `#!` (pronounced hash-pling) to make it happen. The following two sections explain how to enable `#!` support and how to use `#!`.

Enabling `#!` support

`#!` support is enabled by the following procedure:

1. Change directory to `/etc/conf/pack.d/kernel`
2. Edit `space.c` and locate the line:

```
int    hashplingenable = 0;
```

Set the value of `hashplingenable` to 1; after changing the value, the line should look like this:

```
int    hashplingenable = 1;
```

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 PS/2 keyboard mouse

Some models of keyboard mice have been reported to track poorly on particularly fast machines. If, after installing a keyboard mouse using `mkdev mouse`, the cursor response to the mouse is poor, you should try changing the value of `KBM_POLL` in the file `/etc/conf/pack.d/kbmouse/space.c`. The value of `KBM_POLL` should be changed from `0xb0` 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.

MMDF mail router

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 re-booted, the new name is used subsequently.
- Because *execmail* is *setuid root*, it sets its real and effective IDs to be *mmdf*. For this reason, user-based authentication *does not work* for locally generated mail.

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 4.0, and you attempt to boot a kernel from a previous release, 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 a "special" (/s). The kernel does not actually use this "special" memory and so there are no side effects.

Non-tunable kernel parameters

In addition to those parameters mentioned in the "Tuning system performance" chapter of the *System Administrator's Guide*, the values of the following parameters should not be altered: MAXFC, MAXSC, MSGMNI, MSGSSZ, MSGTQL, MSGSEG, NEMAP, NLOG, NSTRPUSH, NLOG, SEMAEM, SEMMNS, SEMMSL, SEMOPM, SEMUME, SEMVMX, SHMMIN STRMSGSZ.

Intel 387 coprocessor problems

Because of design defects in Intel's 80386 chip (B1 stepping, part numbers 540344 and 540362), the Intel 80387 math coprocessor may not operate correctly in some computers, causing the CPU to hang during DMA/paging/coprocessor access. You can work around this problem by changing the tunable kernel parameter *DO387CR3* from 0 to 1 using the *configure(ADM)* utility. See the "Tuning system performance" chapter in the *System Administrator's Guide*.

You can replace the 386 chip with a newer release of the 386 chip (a D-step part), or bypass the 387 chip by adding the **ignorefpu** keyword to the boot command as follows:

```
Boot
: unix ignorefpu
```

This means that the operating system will not use the 387 chip, but you need not remove it physically; the coprocessor is still usable from MS-DOS. To bypass the 387 chip automatically every time you boot your system, add the **ignorefpu** keyword to the */etc/default/boot* file. See **boot(HW)** for more information.

Hardware devices are available from *Ironwood Electronics* to solve this problem.

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 "Video adapters and monitors" in Appendix A of these notes 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 Appendix A, 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 re-inserted.

Removing the Link Kit

If you are planning to remove the Link Kit, you should be aware that it will need to be re-installed 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 2.0 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) 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.

Using the mkdev hd command to configure a host adapter

When you run the `mkdev hd` command to configure a host adapter, you are presented with an incomplete list of host adapters. This list is displayed in two situations:

1. At the command line level when you enter the command

`mkdev hd`

a list of 3 options is displayed. If you are adding a hard disk to a SCSI controller, you will select option 2. You will then be prompted to enter the prefix of your SCSI host adapter, or to enter 'h' for a list. The list that is then displayed omits the prefix for the Western Digital 7000EX. The prefix for the WD7000EX is `wdex`. If you are adding a hard disk to the WD7000EX controller, you should therefore enter `wdex` at the prompt.

2. You are adding a hard disk to a SCSI controller through the use of **sysadmsh**. If this is the case, you will see the list of 3 options (as described in 1.) after entering the command:

sysadmsh

and taking the System ⇌ Hardware option. The system then displays a window of options from which you select HardDisk. The system then displays the list of 3 options. You should then continue as described in 1.

Sector remapping for bad sectors

You should note that several manufacturers do not do AUTOMAGIC sector remapping for bad sectors. There is currently *no software solution* for this problem. For a resolution to the problem, you should contact your manufacturer.

Chapter 7

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. For most applications, the screen redraw command is `(Ctrl)r`.

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 notes

Scancode mode

If you have a port enabled for scancode mode, you will not be able to dial out on that line unless you have a scancode modem.

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 scan codes. 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.

Wyse 60 terminal in scan code mode

We have identified a problem that occurs when a Wyse 60 terminal in PC-TERM (scan code) mode is connected, via a serial line that is also in scan code mode, to a computer running SCO UNIX System V Release 3.2 Operating System Version 4.0. In this situation, if you press any of the keys that generate (Esc) sequences (eg. (Insert), (Home), (Left Arrow) etc.), the terminal and the system will repeatedly send the key press backwards and forwards. This fills the input buffer, making the terminal unusable until you log off the system, or until you set the serial line using the command **set -echo**.

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.

The cd command in the korn shell

When using the Korn shell, if you `cd ..` from a directory that is a symbolic link, the system will take you to the directory in which you were previously located rather than the parent directory of the directory in which you are currently located.

For example, if you were in the directory `/bin`, and you entered the command `cd /u/george`, as expected you are now located in `/u/george`. If you now enter the command `cd ..`, instead of the expected move to the directory `/u`, you will actually move back to `/bin`.

quot(C)

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

Internationalization

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 Num-Lock is on when it is actually off or vice-versa. If you encounter this problem, quickly toggling the Num-Lock key a few times should correct it.

Chapter 8

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."

Furthermore, 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").

XENIX System V compatibility

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 SVID conformance

The AT&T System V Interface Definition (SVID) 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 4.0
SCO UNIX System V/386 Release 3.2 Development System Version 4.0

on 386/486 PC's, 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 should need to buy and install the SCO UNIX System V Release 3.2 Development System Version 4.0 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 Appendix A of these *Release Notes*.

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 Open Desktop 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 4.0 conforms to the Intel Binary Compatibility Standard Edition 2. This means that binary applications built on SCO UNIX System V will run on any computer based on the Intel 386 or 486 instruction sets.

Appendix A

Compatible hardware

The information in this appendix applies to all supported architectures (Industry Standard Architecture (ISA), Extended Industry Standard Architecture (EISA) and Micro Channel Architecture (MCA)), except where explicitly noted. MCA refers to computers that are compatible with the IBM PS/2 computers.

There are many other devices that you can use, which require additional vendor supplied software, that are available from and supported by independent hardware vendors. Call your dealer or sales representative and ask for the third-party IHV/ISV catalogue, or the SCO Directory.

If your computer is listed as a supported machine in this chapter, it should run SCO UNIX System V without any additional hardware or without changing any jumper or switch settings, unless otherwise stated.

NOTE Supported machines are not always supplied with video cards by the same manufacturer. Check the video card for compatibility.

The hardware listed in this appendix has been used with SCO UNIX System V. However, because the manufacturers of compatible machines or add-on peripherals may change configuration, functionality, or firmware at any time, no guarantee is implied. Please write to us with detailed hardware information for possible inclusion on our lists.

Basic hardware requirements

To find hardware that is compatible with your machine, you must know the processor (386 or 486) and the bus architecture (ISA, EISA or MCA). You should also be aware of the type of disk controller in your system.

Some computers arrive with the hard disk only partially formatted. If you have such a machine, use the correct low-level or hard format procedure as described in the manual for your hard disk controller before installing SCO UNIX System V. This does not apply to most SCSI or IDE hard disk drives.

Your hardware configuration must have the original settings and boards before you install the operating system. It is recommended that you install the operating system without any additional hardware installed on the system. Hardware configuration conflicts can make installation of SCO UNIX System V difficult or impossible.

If you have added any boards, make sure that all switches or software-controlled settings are set as recommended in the manufacturer's hardware manual for that board. Some computers require specific switches or software-controlled settings to run SCO UNIX System V. If your computer does not run SCO UNIX System V with the settings as shipped, contact your computer hardware representative for the proper settings.

Supported 386 and 486 machines

The following sections list all machines that have been tested or used with SCO UNIX System V on ISA, EISA and MCA.

Standard Architecture machines

We have used the following machines under SCO UNIX System V:

Acer 1100SX
Acer 1100/20 (System 15 Model 10)
Acer 1100/33 (System 15 Model 20)
Acer 1170
Acer 1200
AcerPower 486SX
AcerPower 500/SX
Acer System 32/20
AcerFrame 3000MP
AcerFrame 3000SP33 (System 25 Model 35)
ALR FlexCache 20/386
ALR FlexCache 25/386
ALR FlexCache 33/386
ALR Power Cache 4e
ALR PowerPro 256/330
ALR VEISA 486/25
ALR 3000 MP
Apricot LS 386sx
Apricot XEN-S 386
Arche Legacy 386/33
Arche Master 486/33
AST Bravo 486/25
AST Premium 386
AST Premium 386/33
AST Premium 486/25E
AST Premium 486/25T
AST Premium 486/33E
AST Premium 486/25TE
AST Premium 486/33TE
AST Premium II 486/33
AT&T PC6386/25 CPU 314
AT&T PC6386/33 CPU 325
AT&T PC6386/33 Star Station
BT M5324
COMPAQ PORTABLE III 386
COMPAQ DESKPRO 386
COMPAQ DESKPRO 386/20
COMPAQ DESKPRO 386s
COMPAQ DESKPRO 386s/20
COMPAQ DESKPRO 386/20e

COMPAQ DESKPRO 386/25
COMPAQ DESKPRO 386/33
COMPAQ DESKPRO 386/33L
COMPAQ DESKPRO 486/25
COMPAQ DESKPRO 486/33L
COMPAQ DESKPRO 486/50L
COMPAQ DESKPRO 486s/25M
COMPAQ DESKPRO M SERIES
COMPAQ LTE 386s/20
COMPAQ SYSTEMPRO

Note: The entire SYSTEMPRO range is supported.

COMPAQ SYSTEMPRO/LT

Compuadd 386
CSS 386/33
Dell 316SX
Dell 320SX
Dell 333D
Dell 333P
Dell 433P
Dell 433DE
Dell 433SE
Dell 450SE
Digital DECstation 316+
Digital DECstation 320
Digital DECstation 325
Digital DECstation 325c
Digital DECstation 333c
Digital DECstation 425
Digital DECstation 425c
Digital DECpc 433 Workstation
Digital DECpc 433T
Digital applicationDEC 433MP
EasyData 386 model 333
Epson Equity 386SX
Epson Equity 386SX/16 plus
Epson Equity 386SX/20 plus
Epson Equity 386/25

Note: Also with storage expansion.

Epson Equity 386/25 plus
Epson Equity 386/20

Note: The Epson PC AX3/25 is equivalent to the Epson Equity 386/25.

Note: The Epson PC AX3 is equivalent to the Epson Equity 386/20.

Everex 386/20
Everex 386/33
Everex 486/33
Goupil uniprocessor 25MHz Tower
GRiDCase 1530
GRiDCase 1550sx
Hewlett-Packard Vectra QS/16S
Hewlett-Packard Vectra QS/20
Hewlett-Packard Vectra RS/16 PC

Hewlett-Packard Vectra RS/20 PC
Hewlett-Packard Vectra RS/20C
Hewlett-Packard Vectra RS/25C
Hewlett-Packard Vectra 386/16N
Hewlett-Packard Vectra 386/20N
Hewlett-Packard Vectra 386/25
Hewlett-Packard Vectra 486s/20
Hewlett-Packard Vectra 486/25T EISA
Hewlett-Packard Vectra 486/33T EISA
IBC 486/25
IBM 35X-040
IBM 35X-043
IBM 40SX-043
IBM 40SX-045
IBM L40SX
Intel 302
ITT 386
Laguna Systems PDQ386
Mitac S500
Mitsuba 386
Mitsubishi PC-386
NEC BusinessMate 386/25
NEC BusinessMate 386/33
NEC BusinessMate 386/33E
NEC BusinessMate 486/25
NEC businessMate 486/25E
NEC Powermate 386/25
NEC Powermate 386/33E
NEC PowerMate 486/25E
NEC 386 20 Mhz
Noble 386 from PC Discount
Nokia Alfaskop System 10 m52
Nokia Alfaskop System 10 m54/m55
Nokia Alfaskop System 10 m57/m58
Northgate 386/33Mhz

Note: Consult with a Northgate Salesperson for information on the specific hardware configurations that support SCO UNIX System V and SCO Open Desktop.

Olivetti EISA System CP486
Olivetti EISA System LSX5010
Olivetti EISA System M486
Olivetti Laptop D33
Olivetti Laptop S20

Note: The Laptop D33 and the Laptop S20 may be used with or without the optional docking station.

Olivetti M386/25
Olivetti M300-10
Olivetti M280-40
Olivetti M380 XP3
Olivetti M380 XP5

Olivetti M380 XP7
Olivetti M380 XP9

Olivetti Notebook S20

Olivetti PC PRO SX16
Olivetti PC PRO SX20
Olivetti PC PRO 486/33
Olivetti PC PRO 486 SX20
Olivetti PC PRO 386 DX33
PC Craft PCC 2400 386

Philips 386 P3371
Philips 486 P3464
Schneider T486/25
Schneider 386sx System 70
Schneider 386 25-340

SNI 8810-50
SNI PCD 3M SX
SNI PCD-3M
SNI PCD-4M
SNI PCD-3T SX
SNI PCD-3T
SNI PCD-4T
SNI PCE-4T

Tandy 4000
Tandon 386/33
Tandon 486/33
Tatung Force 386X
Tatung TCS-8000 386
Tatung TCS-8600 386
Televideo 386/25
Texas Instruments System 1300
Toshiba T2000SX
Toshiba T3100SX
Toshiba T3200SX
Toshiba T5200
Toshiba T8500
Tricord 40/25

Tricord 40/25
Triumph Adler M316
Triumph Adler PCS 386SX
Triumph Adler Walkstation 386 33
Triumph Adler Walkstation 386 SX
Triumph Adler Walkstation 386 SX 20

Tulip tr 386/25
Tulip tr 486e

Note:

On the XP7 and XP9, the Floppy Disk Access Speed option must be set to fast mode.

Note: The Notebook S20 may be used with or without the optional docking station.

Note: The manufacturer's BTLD must be used to load SCO UNIX System V on the Tricord 40/25. Consult your dealer.

Note: The Walkstations 386 33, 386 SX and 386 SX 20 may be used with or without the optional docking station.

Unisys PW2 Series 800/16
Unisys PW2 Series 800/20
Unisys PW2 Series 800/25
Unisys PW2 Series 800/33
Unisys PW2 Series 3163
Unisys PW2 Series 3206
Unisys PW2 Series 3256
Unisys PW2 Series 3336
Unisys PW2 800/486-25A
Victor V486T (486/25MHZ)
Wang DX200
Wang DX2000 (EC 480)
Wang DX2000E
Wang MX200
Wang PC 100
Wang PC 200
Wang PC 380
Zenith Z-386/16
Zenith Z-386/25
Zenith Z-386/33
Zenith 386/20 model ZVB 3524ED
Zenith Z-386/SX20
Zenith Z-386/33E
Zenith Z-486/25E
Zenith Z-486/33E
Zenith Z-486/SX20E
Zenith SuperSport 386sx
Zenith TurbosPORT 386

Micro Channel Architecture machines

We have used the following machines under SCO UNIX System V:

ALR MicroFlex 3300

ALR MicroFlex 7000

ALR Power Cache 4

ALR PowerPro 386/33

ALR 486MC Model 150

Apricot FTe Range

Apricot Qi 300, 600, 900

Apricot Qi 386sx, 386, 486

Apricot Vx FTs range

IBM PS/2 Models

55-SX-X31, 55-SX-X61, 55-SX-041, 55-SX-081, 55-SX-161

56-SX-043, 56-SX-045, 56-SX-049

57-SX-045, 57-SX-A49

65-SX-061, 65-SX-121, 65-SX-S31

70-M61, 70-081, 70-121, 70-161, 70-A16, 70-A21, 70-R21

80-A16, 80-A31, 80-M16, 80-M21, 80-M81

90-AG5, 90-AG9, 90-AJ9

95-AG9, 95-AGF, 95-AJ9, 95-AJD, 95-AJF, 95-AK9, 95-AKD, 95-AKF, 95-V01

P70-031, P70-K61, P70-K21

P75-161, P75-401

NCR 3320 (386sx/16)*

NCR 3321 (386sx/20)*

NCR 3340 (486/25)*

NCR 3345 (Desktop 486/33)*

NCR 3345 (Server 486/33)*

Olivetti P500

Olivetti P750

Olivetti P800

SNI PCM-3Dsx

Tandy 5000MC

* These NCR machines require NCR specific Boot Time Loadable Drivers (BTLDs). Consult your dealer.

Math chips

Your personal computer may include the 80387 math coprocessor, which is automatically detected and supported by SCO UNIX System V. These coprocessors improve floating point efficiency. The 80486DX CPU includes an on-chip coprocessor that is also recognized and used as an 80387. The 80486SX CPU does not include a coprocessor.

Use math coprocessors matching your machine's CPU speed. Follow the manufacturer's recommendations.

At boot time, SCO UNIX System V announces the presence of a math coprocessor with the message:

```
%fpu - 13 - TYPE=80387
```

Please note that switches on the main system board must be set properly to enable 80387 interrupts, and/or your system must be set up with the manufacturer's setup disk, to expect the chip. Ensure that the system diagnostics recognize the coprocessor's presence, and check your hardware manual for the proper switch settings.

Also, please note that on some motherboards, the operating system incorrectly recognizes the presence of an 80387 coprocessor even if the chip is not installed. This problem is prevalent on machines that use the Intel 302 motherboard; if your computer incorrectly recognizes the presence of an 80387 chip, make sure that blocks E48 and E49 are not connected with a jumper connection.

Some 80387 exceptions are masked. Refer to the manual page for 80387(HW).

Intel Panther Math Upgrade Chip

This release of SCO UNIX System V supports the Intel Panther Math Upgrade Chip for Intel 386SX PCs.

Weitek coprocessors

Weitek numeric coprocessors are also supported. This support extends only to runtime; there is no current development support for creating binaries that take advantage of numeric coprocessors.

In order for the Weitek chip to be recognized by the system, one file needs to be edited in the following way:

1. In the file `/etc/conf/sdevice.d/weitek`, there should be a line similar to the following:

```
weitek N 1 0 0 ...
```

Change the “N” (for no) to a “Y” (for yes).

2. Issue the following commands to relink the kernel:

```
cd /etc/conf/cf.d  
./link_unix -y
```

3. Reboot the machine; the Weitek chip will be recognized.

Memory cards

In general, most memory cards work with SCO UNIX System V. If you experience “panic: parity” errors it is often because of low-quality or mixed types and speeds of memory chips or cards. This problem is especially prevalent with the 32-bit static RAM chips used in older 386 machines.

With memory cards, check the switch settings (or software setup) on both the card and motherboard. Refer to the hardware manuals for your computer and for the memory card to find the correct switch settings or software setup. SCO UNIX System V supports up to 512 Mbytes of main memory.

NOTE Memory cards must be configured for extended not expanded mode.

32-bit memory

It is *strongly* recommended that you use 32-bit memory from your machine manufacturer. 16-bit memory is much slower, and will degrade overall machine performance.

NOTE Certain manufacturers reserve the upper 384K of the first megabyte for MS-DOS. On some machines, this “shadow” RAM cannot be accessed by SCO UNIX System V. You may need to install additional memory to run SCO UNIX System V. If possible, “BIOS shadowing” and “video shadowing” should be disabled.

If you see a message such as:

FATAL: parity error on the Motherboard

or

FATAL: parity error on add-on card

or

PANIC: Parity error address unknown

or

PANIC: Parity error at address 0xxxxxx

some part of your hardware is sending a “non-maskable interrupt” (a signal sent by the hardware that halts the operating system). The precise message will depend on your particular system. You should run your system’s hardware diagnostics tests if available. In addition, physically re-seat your memory cards and chips, and check for bent pins, and so on. If these measures fail to correct the problem, or you do not feel comfortable in checking your hardware yourself, seek assistance from professional hardware experts. One frequent cause of the problem is memory chips that are slower than factory-recommended chips.

Disk controllers and host adapters

SCO UNIX System V supports the use of standard PC hard disk controllers that present an ST506 interface to the operating system, and which support a range of hard disks. Also supported are SCSI host adapters. The following combinations of controllers are supported:

- one or two ST506/ ESDI controllers (on Micro Channel machines, only one is supported).
- multiple SCSI adapters from different vendors. Theoretically, there is no upper limit to the supported configuration, but SCO has only tested a maximum of two adapters with up to seven devices per adapter.
- two COMPAQ IDA controllers plus four intelligent array expansion controllers.

The following table summarizes the number of devices tested on the listed controller/adaptor:

Controller or Adapter	Maximum number of devices tested
ST506/ESDI	2 disks per controller
SCSI	7 devices per adapter
IDA	4 drive pairs per IDA
Intelligent array expansion controller	

Non-SCSI hard disk controllers on Standard (and EISA) Architecture

We have used the following controllers under SCO UNIX System V:

- Adaptec ACB-2320
- Adaptec ACB-2322*
- Adaptec ACB-2370 RLL
- Adaptec ACB-2372 RLL*
- Adaptec 6260
- COMPAQ 32-Bit IDA Controller
- COMPAQ 32-Bit IDA Expansion controller
- DPT MX3011***
- DPT PM3011***
- DTC WD1010
- DTC WD2010
- Western Digital WD1010
- Western Digital WD1003**
- Western Digital WD1003-WA2**
- Western Digital WD1005
- Western Digital WD1007
- Western Digital WD1009-SE1

* These models are hard disk and floppy disk controllers.

** The Western Digital controller cards use either WD1010, WD2010, or WD2020 controller chips.

*** The DPT controller cards must have EPROM 2E or later to run SCO UNIX System V on a COMPAQ.

SCSI adapters supported on Standard (and EISA) Architecture

We have used the following SCSI adapters under SCO UNIX System V:

Adaptec AHA-152x SCSI Host Adapter
Adaptec AHA-154x SCSI Host Adapter
Adaptec AHA-174x SCSI Host Adapter
COMPAQ SCSI Option Adapter *
COMPAQ SCSI Option Compression Adapter *
Corollary C-bus
DPT EISA SCSI (2012a and 2012b)
DPT ISA SCSI (2011)
Future Domain (TMC 860 TMC 885) - 950 series 8-bit
Future Domain (TMC 1660 TMC 1680) - 1800 series 16-bit
Olivetti ESC Host Adapter
Western Digital WD 7000
Western Digital WD 7000EX

* The COMPAQ SCSI host adapters are only supported for use with Compaq tape drives.

Hard disk controllers on Micro Channel Architecture

The following controllers are supported for Micro Channel Architecture:

Adaptec 2610 (ESDI disk controller)
Adaptec 2620 (ST506 disk controller)
IBM (ESDI disk controller)
IBM (ST506 disk controller)
Western Digital 1006V-MCI (ST506 disk controller)
Western Digital 1007V-MCI (ESDI disk controller)

SCSI host adapters supported on Micro Channel Architecture

The following host adapters are supported for Micro Channel Architecture:

Adaptec AHA-1640 (SCSI host adapter)*
Future Domain (MCS 700) - 1800 series MC 16-bit
IBM (SCSI disk controller)**
SUMO SCSI Host Adapter ***

* Most PS/2 clones

** IBM PS/2 only (not compatibles)

*** To make the SUMO board work with SCO UNIX System V, install the jumper marked "code."

ST506 and ESDI controllers

Many ST506 and ESDI hard disks work with SCO UNIX System V. Whether or not a disk works depends upon the disk controller board used. For the disk to work, the controller must meet two tests:

1. The disk controller must be register-level compatible with the ST-506 specification for that configuration.
2. The controller does not require special vendor software to work under MS-DOS.

If a controller meets these tests, it should work, but if it fails these tests, it will not work.

SCSI host adapters (for non-IBM proprietary SCSI host adapters)

SCSI host adapters accept devices with SCSI drivers, including hard disks, tape drives, and CD-ROM drives. Each device on the SCSI bus must have an address. The address has two components: an address for the controller and an address for the device itself. This device address is known as a logical unit address (LUN). The ID number corresponds to the jumper or switch settings on the disk, so care must be taken that hard disk settings are correct. The primary disk must be ID 0. Additional disks may be any other ID between 1-7. Note that the host adapter uses one of the ID numbers (typically number 7). The LUN number must always be 0.

NOTE IBM proprietary host adapters recognize the boot disk of Host adapter 0, id_6, LUN 0.

Western Digital WD7000 host adapter notes

The WD7000 adapter has not been tested extensively and certain hardware configurations do not appear to work. If the factory configuration is used, the system typically hangs during the installation of the N2 diskette. Machines that have been tested or reported to work with the WD7000-ASC and WD7000-FASST are listed later in this section. The difference between the WD7000-ASC and the WD7000-FASST is in the BIOS. The FASST2 boards use the BIOS developed by Columbia Data Products. The ASC boards use a Western Digital BIOS. If you are using a machine that is not on this list, or is on the list of machines that have problems, the system usually reboots unexpectedly during normal operation. (Note that other systems not listed here may also work.)

Interrupt 12 conflict

The following table describes the correct configuration for the first WD7000 host adapter.

Interrupt	12
DMA	6
Base Address	0x350

Systems which contain a keyboard style mouse at interrupt 12 may hang during the installation of the N2 floppy. The WD7000 driver in SCO is set to interrupt 12 and will conflict with this type of mouse. You should disable the mouse before attempting to install SCO UNIX System V. If the mouse cannot be disabled on your system, you will need to change the interrupt of the WD7000 card from 12 to an unused value, and use the **adapter=...** boot string during the installation. See "SCSI host adapter configuration" in the "Configuring devices at installation or boot time" section of these notes for instructions on the correct use of this boot string. See your WD7000 manual for instructions on changing the card's interrupt.

In the following example, the WD7000 card is installed using a bootstring with the interrupt set to 14:

```
defbootstr adapter=wdha(0x350,14,6)
```

After successfully installing and rebooting, you should use the following procedure to correct this interrupt conflict:

1. In the file `/etc/conf/sdevice.d/wdha`, there should be a line similar to the following

```
wdh Y 1 5 0 12 350 ...
```

Change the 12 (interrupt level) to another interrupt value which is not currently used in the machine.

2. Issue the following commands to relink the kernel:

```
cd /etc/conf/cf.d
./link_unix -y
```

3. Shut down the machine as described in the *System Administrator's Guide* and change the interrupt vector jumper setting on the WD7000 card to match the value entered in step 1.
4. Re-enable the mouse and reboot.

Reported to work with the WD7000

The following systems have been reported to work with the WD7000, but we have not tested them. They are supported only by the hardware manufacturer.

ACER 386/20
ALR Flexcache 25386 (IOCR mod on 7000) *
AMI Mark II
ARC Skyscraper
AST Premium 386/16
AST Premium 386/25 (IOCR mod on 7000) *
AT&T 6386WGS
COMPAQ Deskpro 386/25
CSS Mother Superior
Everex Step 25
Rose Hill 386
Tandon 386/20
Tandy 3000
TI 386/20
Wyse 16MHz
Wyse 3216-40

- * **IOCR means I/O Channel Ready.** If the System Motherboard asserts this signal, then the adapter will extend the memory cycle. This signal is typically used by systems with slow memory. If a system uses **IOCR** and the adapter does not support **IOCR**, then the DMA will not work properly. The following revisions of the 7000 boards support **IOCR**:

WD7000-FASST2 X5
WD7000-FASST2 A through H

All boards previous to revision X5 do not have **IOCR**.

Difficulties or incompatibilities have been reported with the following machines:

COMPAQ 386/20E
PC Kraft 386/25 with 387/20

Western Digital WD7000EX host adapter notes

A kernel re-link may fail if you are using the WD7000EX card. To relink successfully, you should proceed as follows:

1. In the file `/etc/conf/sdevice.d/Stp`, there should be a line similar to the following:

Stp N 1 ...

Change the "N" (for no) to a "Y" (for yes).

2. In the file `/etc/conf/sdevice.d/Srom`, there should be a line similar to the following :

`Srom N 1 ...`

Change the "N" (for no) to a "Y" (for yes).

3. Enter the following commands to relink the kernel:

`cd /etc/conf/cf.d`

`/link_unix -y`

The kernel relink will complete successfully.

4. Reboot the machine.

Adaptec AHA-154X host adapter notes

Not all manufacturer's computer systems are compatible with Adaptec host adapters. If you are unable to get the host adapter to function, or you experience file corruption, use the test documented in this section under "Hardware incompatibilities" to see if an incompatibility exists. You can also contact your manufacturer or Adaptec to determine if your hardware is incompatible.

The Adaptec AHA-154X host adapter supports first-party DMA, asynchronous and synchronous peripherals, jumper selectable DMA and interrupt channels and I/O port addresses, programmable mailbox architecture that allows multithreaded operation on the SCSI bus, and even or odd starting address transfers. The AHA-154X back-end software allows setting of 154X adapter-configurable parameters. Some of the possible settings are:

- bus on-time
- bus off-time
- transfer rate
- number of CCBs (Command Control Blocks)
- number of mailboxes

The Adaptec 154x range of SCSI host adapters should run correctly with the manufacturer's default settings. It should be configured at base address 0x330, IRQ 11, and DMA channel 5.

If you are installing a second Adaptec AHA-154x board, you must reset several jumpers to be configured at base address 0x230, IRQ 12, and DMA channel 6. For two AHA adapters to coexist, the BIOS must be disabled on the second adapter. (For more information, refer to your Adaptec documentation.)

Formatting and verifying devices

The Adaptec 154x series of controllers have a set of BIOS routines to maintain and debug SCSI devices.

First you will need to know what BIOS address is on the Adaptec controller. This information can be found in the Adaptec manual. The default address is 0DC000H. Once you have this number you can perform a number of tasks. One such task is the formatting and verifying of SCSI devices. All SCSI devices (hard disks) should be formatted prior to installing SCO UNIX System V on an adapter.

To format your devices you will need to do the following:

1. Boot DOS
2. Run the DEBUG program
3. At the "-" prompt enter: `g=dc00:6` (notice how the BIOS address is truncated). A menu is displayed.
4. Select the format option on the drive specified. (Note that this destroys all data on that disk.)
5. When the format is complete, select the verify option on the drive specified.
6. Exit the menu.

Hardware incompatibilities

There is an option that will allow you to test the interface between the Adaptec controller and motherboard. To run this test, do the following:

1. Boot DOS
2. Run the DEBUG program
3. At the "-" prompt enter: `g=dc00:9` (notice how the BIOS address is truncated).

You should see a set of diagnostic messages displayed as the test is run. If you see a fail message, or no diagnostic messages are displayed, a hardware incompatibility exists. Your system may have trouble loading and running SCO UNIX System V. Since this is a hardware level inconsistency, there is no software patch available.

Olivetti ESC host adapter notes

The following notes apply to the Olivetti ESC host adapter:

Relinking the kernel

Each time you relink the kernel, you may see this message:

warning: no dma channel specified for scsi device: prefix oha

You can ignore this message.

Tape drive accessing delay

If you are installing the ESC host adapter on a machine with less than 4 megabytes (MB) of RAM, there is a two-minute delay in accessing the tape drive. This does not occur if you use 8MB of RAM.



Sumo host adapter notes

The following describes the correct configuration for the Sumo Host Adapter :

Interrupt	14
Base Address	0x310

The first Sumo card is configured at the factory default settings.

Using two host adapters of the same type

If you are using two host adapters of the same type, the adapter at the lower-numbered slot in the computer is adapter 0. The adapter at the higher-numbered slot is adapter 1. However, if you add a second adapter of another type, its number is also 0. The prefix differentiates adapters of different types. Be certain to use the correct numbers when you specify adapters.

Defining the primary host adapter

If you have a SCSI root disk, then the host adapter attached to the root disk is the primary host adapter. To avoid confusion if you are using two host adapters, place the primary host adapter in the lower-numbered chassis slot. Use a lower-numbered BIOS address as well. Refer to your hardware documentation for detailed instructions.

Adding a secondary SCSI host adapter

Follow these steps to add a secondary SCSI host adapter:

1. Place the secondary board in any available slot that is higher than the slot containing the primary host adapter.
2. Configure the secondary host adapter. You may need to run some setup or configuration utilities. Refer to your hardware documentation for detailed instructions.
3. Reboot your machine.

The next time that you access a device that is attached to the secondary board with a **mkdev**(ADM) script (such as **mkdev tape**), the system notes the existence of the secondary host adapter. The **mkdev** script then prompts you for configuration information as described in the next section, "Referencing a second host adapter."

Referencing a second host adapter

The **mkdev** script prompts you for information when you add a second host adapter of the same type as the first. Be prepared to supply the following information the first time that you reference the second adapter:

- interrupt vector
- start I/O hexadecimal address
- stop I/O hexadecimal address

Refer to your hardware documentation for information on determining these values.

Tuning SCSI disk performance

The SCSI subsystem in the SCO UNIX System V kernel is set up to perform well with a broad range of SCSI adapters and system loads. It may be possible to improve the performance characteristics for specific load conditions by experimenting with certain SCSI configuration variables. There are two variables which reside in the file `/etc/conf/pack.d/Sdsk/space.c` called **Sdsk_sleep_option** and **Sdsk_no_sg**. These variables can take the values 0 or 1. The **Sdsk_sleep_option** variable controls the way that requests are sent to the adapter, and the **Sdsk_no_sg** variable determines whether the adapters perform scatter-gather or not. These variables can be edited by hand and a new kernel re-linked, before running suitable performance tests.

In addition, the value of the **SDSKOUT** tuneable parameter can also be modified in `/etc/conf/cf.d/stune`. This parameter controls the maximum number of outstanding requests sent to the adapter. If you only have a Corollary SCSI adapter installed in your system, you may get some performance gains by tuning this value to a number below 255. If an adapter other than Corollary SCSI is present in your system, this value should be 16 or below. The default value for **SDSKOUT** can be found in the file `/etc/conf/cf.d/mtune`.

If no gain is noticed after modifying the above parameters, then they should all be changed back to their original values. Note that changing these parameters may produce gains under some conditions at the expense of losses under others.

IDE drives and disk controllers

The Integrated Drive Electronics (IDE) interface design is characterized by the connection of a low cost IDE adapter (frequently embedded in the motherboard) to one or two IDE hard drives.

The drives are connected to the adapter by a single 40 pin cable which carries both control and data information.

Each of the two IDE drives which may be connected to a single adapter plays one of three roles :

1. If only one drive is connected it must be jumpered for single drive mode.
2. If two drives are connected, one drive must be jumpered for the two drive master mode.
3. If two drives are connected, one drive must be jumpered for the two drive slave mode.

You cannot take a one drive system and just add another drive without changing the jumpers.

IDE drives, as commonly marketed today, emulate the ST506 interface common to all MFM and RLL, and most ESDI controller/drive combinations. So, when installing an IDE drive, the ST506 interface selection should be used.

Another feature of most IDE drives is that the embedded controller can do sector translation automatically. This allows the drives to be configured with several different head/cylinder/sectors per track settings. You may want to use some settings other than the factory defaults if your drive has more than 1024 cylinders or if the new settings more closely match some drive type in the ROM BIOS (an important issue if you are also installing DOS).

This advanced automatic translation feature sometimes has an associated cost. Many IDE hard drives cannot be low-level formatted by normal formatting utilities. The utility program will not understand the underlying hardware of the IDE drive and may render the drive useless. It is important to check with the manufacturer of any IDE hard drive before attempting to low-level format the drive.

Most IDE drives work the same way and most will work with SCO UNIX System V without any special effort.

So far, we do not have any IDE hard disk drives which we know for sure will not work with SCO UNIX System V. The following drives have been used with SCO UNIX System V:

Conner CP3104
Conner CP3204F
Microscience 7070 series *
Microscience 7100 series *
Plus Development 120-AT
Quantum ProDrive LPS
Rodime RO 3000AP series *
Seagate ST1144A

* The word "series" indicates that a vendor is selling a group of drives that have sequential identification numbers. For example, the Rodime RO 3045A drive is a member of the Rodime RO 3000A series.

Add-on hard disks

Many hard disks can be used by SCO UNIX System V provided that the disk controller supports the drive. Controllers supporting drive interfaces, such as RLL or ESDI, work as long as the controller presents a compatible interface to the bus.

NOTE This section applies only to ST506 and ESDI hard disks. SCSI and IDE disks are preformatted and use a different cylinder/head/sector translation logic, which means that the considerations for ST506 and ESDI disks do not apply. Use `mkdev hd` to add hard drives to the system, regardless of their type.

Some hard disks come from the factory only partially formatted (for example, the Maxtor 1140 140 Mbyte). This may create a problem which becomes evident during installation, when `badtrk(ADM)` indicates that every sector past a certain cylinder/head location is bad. You should contact the manufacturer to determine whether or not the disk is completely formatted. There are several products available that format hard disks.

Compatible hard disk controllers are discussed in the section entitled "Disk controllers and host adapters."

- For a disk supported by the ROM Fixed Disk BIOS, the motherboard ROM must have an entry for the disk (type) determined by the number of heads, cylinders, tracks per cylinder (heads), sectors per track, and other characteristic information.

Follow the manufacturer's instructions to set switches or configuration.

- For a disk not supported by the ROM Fixed Disk BIOS, the user can type in information that overrides the ROM disk configuration information during installation.

If you are unsure of the parameters that should be entered for a disk not supported by the ROM Fixed Disk BIOS, you should contact your disk manufacturer for the information. The **dkinit** program (called during installation) allows you to input the disk parameters.



Disks larger than 1024 cylinders

SCO UNIX System V supports disks with more than 1024 cylinders with the following restrictions:

- The disk controller must support disks with more than 1024 cylinders.
- If the disk is configured as the primary hard disk, the root filesystem for all bootable partitions must lie within the first 1024 cylinders. This is because the ROM BIOS cannot access boot or operating system information if it lies beyond the 1024th cylinder. If the root filesystem falls outside the first 1024 cylinders, an error message will be displayed by **boot(HW)** as follows:

Error: request outside range of BIOS (1024 cylinders)

You can use the rest of the disk for swap space and/or additional filesystems. If you install only a UNIX partition, you should make certain that the root filesystem falls within the first 1024 cylinders.

divvy(ADM) will display a warning message if you try to install across more than 1024 cylinders. For example, with the DPT PM3011 controller, SCO UNIX System V works with disks containing up to 2048 cylinders, 16 heads, and 63 sectors, for a total maximum disk capacity of 1 gigabyte. Many hard disks can be used with SCO UNIX System V. In the case of ST506/ESDI drives, the drive must be supported by the ROM BIOS, or the ROM parameters must be entered at installation time. Check your computer hardware reference manual for the appropriate ROM table entries for your computer.

Tape drives and controllers

Note that the tape drives described in these notes are sometimes sold under other brand names. It is possible to have one cartridge tape drive plus a mini-cartridge or QIC-40 drive configured on a system. This limit does not apply to SCSI tape devices. Up to seven SCSI tape drives are supported on a SCSI bus. QIC-24 format is supported on the full size cartridges. Tape support is raw (character only), no block device. A no-rewind device exists for writing multiple tape archives on a single tape. A tape utility, **tape(C)**, is provided for rewinding, erasing, formatting, retensioning, and so on. Digital audio tape (DAT) and 8mm (video) tape drives are also supported as SCSI devices. Fast file search and tape partitioning are only supported on some specific drives (for example, Hewlett Packard DAT).

SCSI tape drives and ECC

Tape ECC (Error Correction Code) support is not available for SCSI tape drives at this time. However, many SCSI tape drives have hardware ECC.

Tape drives and controllers on Standard (and EISA) Architecture

The cartridge tape driver included in this release works with the following drive/controller combinations:

Supported QIC-02 tape controllers and cartridge drives

Manufacturer	Controller	Drive	Type	Notes
Archive	SC499-R	Scorpion 5945, FT60, ST600	A	
Archive	402	Viper 2060L, Viper 2150L, VP60, VP150	A	
Cipher	QIC-02	PB60I, CP-125B, CP60B	W	
Cipher	Cipher 811/817	5400/PLUS	E	
COMPAQ	COMPAQ QIC-02	135 MB	W	
COMPAQ	COMPAQ QIC-02	150/250	W	
COREtape	Wangtek PC-36	Wangtek 5xxxEN	W	
Mountain	QIC-02	60 MB external	M	
Mountain	QIC-02	Filesafe 7060	M	
Mountain	QIC-02	Filesafe 7150	M	
Mountain	QIC-02	Filesafe 7250-Qic	M	
Mountain	PC-36	60MB internal	W	
Mountain	PC-36	Filesafe 7000 internal	W	
Mountain	PC-36	150MB internal	W	
Mountain	PC-36	Filesafe 7250 internal	W	
Olivetti	Wangtek PC-36	Wangtec 5xxxEN	W	(1)
Sankyo	QIC-36			
Sankyo	QIC-36			
Tandberg Data	V551	TDC 3610, TDC 3650	E	
Tecmar	PC-36	Qic60AT, QT-60I, QT-90I, QT-125I	W	
Tecmar	QIC-02 multi-chip	QT-60E, QT-90E, QT-125E, QT-150E	T	
Tecmar	QIC-02 single-chip	QT-60E, QT-90E, QT-100, QT-125E, QT-150E	T	
Tecmar	QIC-02 single-chip	ProLine 250Q	T	
Wangtek	PC-36	5099EN, 5125EN, 5150EN	W	
Wangtek	PC-36	LS5099EN-EXT, EK Kit	W	
Wangtek	PC-02 multi-chip	5099EG, 5125EG, 5150EG	W	
Wangtek	PC-02 multi-chip	5150EQ	W	
Wangtek	PC-02 multi-chip	LS5150EQ-EXT, PK Kit	W	
Wangtek	PC-02 single-chip	5099EG, 5125EG, 5150EG	W	
Wangtek	PC-02 single-chip	5125EQ, 5150EQ	W	
Wangtek	PC-02 single-chip	LS5150EQ-EXT, PK Kit	W	

Most controllers that conform to the QIC-02 standard should work, but only the listed units have been tested.

Notes:

1. The Olivetti tape controller's factory jumper settings do not match the type W drive default values. To use the Olivetti drive without changing the controller card's jumper settings, use the **mkdev tape** command to select all four of the following settings:

Type	DMA	Interrupt	Base Address (hex)
W	1	25	0x288

Default settings

Manufacturer	Base Address	DMA Channel	Interrupt	Type
Archive	0x220	3	3	A
COMPAQ	0x300	1	5	W
Computone	0x200	1	4	A
Everex	0x2C0	1	5	X
ITT	0x338	1	5	W
Mountain	0x28C	1	3	M
Tecmar	0x330	1	5	T
TI	0x220	3	3	A
Wangtek	0x338	1	5	W

- Archive drives using the SC402 controller do not use the default type A interrupt 4. Use the **mkdev tape** command to change the interrupt or restrap the controller card.
- High density 150 Mbyte drives require DC6150 or DC600XTD tapes for writing.
- All QIC format tapes will read the 60mb format tape install product. Tapes written on larger capacity drives (for example, 150mb) cannot be read on a 60mb drive.

In addition, the following floppy tape drive/controller combinations are supported:

Supported floppy tape controllers and cartridge drives

Manufacturer	Model No.	Drive
Archive	XL5540	QIC 40 *
Archive	XL5580	QIC 80 *
Irwin	187	
Irwin	285	80MB **
Irwin	2080	80MB **
Irwin	2120/4100 controller	80/120MB **
Mountain	TD4000 internal	QIC 40 *
Mountain	Filesafe4000 internal	QIC 40 *
Mountain	TD8000	QIC 80 *
Mountain	Filesafe8000 internal	QIC 80 *
Tecmar	QT-40I	QIC 40 *
Tecmar	MiniVault 120I	QIC 80 *
Wangtek	FAD 3040F, 3500	QIC 40 *
Wangtek	3080F	QIC 80 *

* When installing these drives using **mkdev** tape, select the option, "QIC-40."

** When installing these drives using **mkdev** tape, select the option, "minicartridge."

Tape drives and controllers on Micro Channel Architecture

Supported tape controllers and cartridge drives

Manufacturer	Controller	Drive	Type
Archive	409	Viper 2060L	A
Archive	409	Viper 2150L, VP60, VP150	A
IBM	QIC-02	6157-001	X
IBM	QIC-02	6157-002	X
Mountain	QIC-02	60 MB external, 150 MB external	M
Mountain	QIC-02	Filesafe 7060, Filesafe 7150	M
Mountain	QIC-02	Filesafe 7250-Qic	M
Tecmar	QIC-02 multi-chip	QT-60e,QT-90e,QT-100,QT-125e,QT-150e	T
Tecmar	QIC-02 single-chip	QT-60e,QT-90e,QT-125e,QT-150e,QT-100e	T
Tecmar	QIC-02 single-chip	ProLine 250Q	T
Wangtek	MC-02 multi-chip	5125EG,5150EG	W
Wangtek	MC-02 multi-chip	5125EQ,5150EQ	W
Wangtek	MC-02 multi-chip	LS5150EQ-EXT, MK Kit	W
Wangtek	MC-02 single-chip	5099EG,5125EG,5150EG	W
Wangtek	MC-02 single-chip	5125EQ,5150EQ	W
Wangtek	MC-02 single-chip	LS5150EQ-EXT, MK Kit	W

Most controllers that conform to the QIC-02 standard should work, but only the listed units have been tested.

Default settings

Manufacturer	Base Address	DMA	Interrupt	Type
Archive/Everex	0x300	1	3	E
IBM 6157	0x3120	2	6	X
Mountain	0x200	1	5	M
Tecmar/Wangtek	0x300	3	5	T

In addition the following tape drive/controller combinations are supported:

Supported floppy tape controllers and cartridge drives

Manufacturer	Model No.	Drive	Notes
Archive	XL3580	QIC 80 *	
Mountain	TD4000 internal	QIC 40 *	
Mountain	Filesafe4000 internal	QIC 40 *	
Mountain	TD8000 internal	QIC 80 *	
Mountain	Filesafe8000 internal	QIC 80 *	
Tecmar	QT40I/PS	QIC 40 *	
Tecmar	MiniVault 120I/PS	QIC 80 *	
Wangtek	FAD 3500, 3040P	QIC 40 *	
Wangtek	3080P	QIC 80 *	

* When installing these drives using **mkdev** tape, select the option, "QIC-40."

SCSI tape drives

The following SCSI tape drives are supported for ISA, EISA and MCA:

Supported SCSI Tapes Drives

Manufacturer	Drive	Notes
Archive Viper 2060s/2060es	¼ inch	
Archive Viper 2150s/2150es	¼ inch	
Archive ST250i/e	¼ inch	
Archive Viper 2525s/2525es	¼ inch	
Archive ST525i/e	¼ inch	
Archive ST 2000i/e	DAT 4mm	
Archive Python 4520NT/4521NT	DAT 4mm	
Archive Python 4330XT/4331XT	DAT 4mm	
Cipher St150S	¼ inch	
COMPAQ 320/525	¼ inch	
Exabyte 8200	8mm	

(Continued on next page)

Supported SCSI Tapes Drives (Continued)

Manufacturer	Drive	Notes
Hewlett Packard 35450A	DAT 4mm	(1)
Hewlett Packard 34570	DAT 4mm	(1)
Hewlett Packard 34580	DAT 4mm	(1,2)
Hewlett Packard D2034A	¼ inch	
IBM 2.3 GB SCSI Tape Drive	8mm	
Maynard DAT	DAT 4mm	
Maynard Maynstream 525Q	¼ inch	
Maynard Maynstream 1300	DAT 4mm	
Maynard 2200HS	8mm	
Mountain Filesafe 7250	¼ inch	
Mountain Series 2100	8mm	
Mountain Series 2100SA	8mm	
Sankyo CP-150SE		
Sankyo CP-320ES		
Tandberg TDC 3820		
Tandberg TDC 3822		
Tandberg TDC 3660	¼ inch	
Tecmar QT-250ES		
Tecmar QT150ES/QT525ES	¼ inch	
Tecmar ProLine 150ES/Proline 525ES	¼ inch	
Tecmar THS2200	8mm (with 424 firmware)	
Tecmar ProLine 2200	8mm (with 424 firmware)	
Tecmar DATaVault	DAT 4mm	
Wangtek 5099ES/5150ES/5150ES ACA	¼ inch	
Wangtek 5525ES/5525ES ACA/51000	¼ inch	
Wangtek 51000	¼ inch	
Wangtek 6130FS/6130HS	DAT 4mm	(1)
Wangtek 6200	DAT 4mm	

Notes:

1. Wangtek and Hewlett-Packard DAT drives require a **tape erase** command before the first write to a new tape.
2. Incorporates DCLZ data compression in hardware.

DAT drives

The following notes apply to DAT drives.

- You should wait for the drive to finish its initialization sequence before attempting to access the device. This is usually very swift on a non-DAT device but may take 30 seconds or more for a DAT.
- If you make more than one read/write access to a tape, it is quicker to use the no unload device and just press the unload button on the drive to retrieve the tape.

CD-ROM drives

SCO UNIX System V supports the following CD-ROM drives configured as SCSI devices:

Hitachi CDR-1750S
IBM-3510-002
IBM 0800
IBM 0845
NEC CDR-73
NEC CDR-75
NEC CDR-77
NEC CDR-83
Toshiba XM3301B

The **mkdev high-sierra** command adds support for CD-ROM filesystems to the UNIX system kernel. When installing a SCSI CD-ROM drive, you must use an SCO supported host adapter. Supported adapters are listed in the section entitled "Disk controllers and host adapters." The **mkdev cdrom** command must then be used to configure a CD-ROM drive. To bring the CD-ROM drive online, make sure you insert a disk. If you attempt to bring up the drive without inserting a disk, the message "cannot open" is displayed.

Further information is provided in the "Adding hard disks and CD-ROM drives" chapter in the *System Administrator's Guide*.

Video adapters and monitors

Any video adapter that is register-level compatible with a standard adapter should run under SCO UNIX System V.

SCO UNIX System V supports the use of two video adapters and two monitors. One adapter should be capable of color and one capable of mono only. Use of only a single VGA adapter is supported.

In general, adapters bundled with supported computers (monochrome or color monitor) work with SCO UNIX System V.

Video adapters on Standard Architecture and EISA Architecture

This section concerns video adapters supported under SCO UNIX System V for Industry Standard Architecture and Extended Industry Standard Architecture machines. The following table lists tested graphics adapters.

NOTE The listed adapters are only supported by SCO UNIX System V up to the standard level. This is true of CGA, VGA, EGA and Hercules cards. Any higher level of support must be accomplished at the application level.

Tested graphics adapters

Card

ATI WONDER
ATI WONDER PLUS
ATI VGA
ATI VGA WONDER
Chips 451
Chips 452
COMPAQ AG1024
COMPAQ Plasma
COMPAQ VGC
Cornerstone SinglePage
Cornerstone PC1280
Cornerstone DualPage
Eizo MD-B07
Eizo MD-B10
Eizo Extra/EM
Genoa SuperVGA † ‡
Grid System 1530 Display
Hercules Monochrome
HP D2382A (VGA mode)
HP IGC
HP Super VGA
IBM 8514/A
IBM EGA
IBM VGA
Olivetti EISA Video EVC
Orchid Designer * †
Paradise 8514/A Plus
Paradise VGA 1024
Paradise VGA Plus
Quadram QuadVGA
Renaissance Rendition II
STB Extra EM †
Tecmar VGA/AD
Toshiba Grid 758 Display
Toshiba Grid Plasma Display
Trident TVGA 8900
Verticom MX/AT
Video Seven VEGA
Video Seven Fast Write
Video Seven VGA/Deluxe
Video Seven VGA 1024i
Video Seven VRAM

- * The Orchid graphics adapter card does not work in extended mode on a 20 megahertz or faster bus. In addition, the Orchid uses IRQ2 during certain refresh operations in particular video modes.
- † If you are using STB VGA/EM or Genoa Super VGA graphics boards, character mode is not properly restored to the console when exiting from graphics mode. Certain characters are followed by vertical bars when you terminate SCO UNIX System V.
- ‡ The Orchid Designer and Genoa SuperVGA boards conflict with the addresses used by the 3c503 and WD80003E network cards. This problem involves memory-mapped I/O.

NOTE If video is integral to the motherboard of the computer, many of the video adapters listed will not function.

Video cards and monitors on Micro Channel Architecture

Some Micro Channel Architecture machines have the VGA built into the motherboard. Adapters that come as the default adapter in supported computers (monochrome or color monitor) work with SCO UNIX System V.

The following video cards are supported under SCO UNIX System V:

- Apricot Qi, Integral VGA
- IBM Personal System/2 Integral VGA adapter
and the 8503, 8512, 8513, and 8514 monitors
- IBM Integral XGA (In VGA mode)
- Olivetti P500, Integral VGA
- Olivetti P800, Integral VGA
- Tandy 5000MC, Integral VGA

Mice and other graphic input devices

The following graphic input devices are supported:

- Hewlett-Packard C1413A Keyboard Mouse
- IBM Personal System/2 Mouse
- Logitech Bus Mouse
- Logitech high-resolution keyboard mouse
- Logitech Mouseman (serial, cordless, bus, and PS/2 keyboard versions)
- Logitech Serial Mouse
- Microsoft Busmouse or InPort Bus Mouse
- Microsoft Serial Mouse
- Mouse Systems PC Mouse
- Mouse Systems PC Mouse II*
- Olivetti Bus Mouse
- Olivetti high-resolution keyboard mouse
- Summagraphics Bitpad

* The Mouse Systems PC Mouse II is an optical mouse. You must use it in Microsoft Serial Mouse emulation mode and add it to the system as a Microsoft Serial Mouse.

Serial I/O boards

This section describes the conditions and results of using various serial I/O boards with SCO UNIX System V. Standard single port serial I/O boards function as expected if COM1 and COM2 are fully compatible with the standard specifications for these serial ports.

To configure the system for the serial board you are installing, you must run the **mkdev serial** command. See the "Adding multiport cards, memory, and other bus cards" chapter of the *System Administrator's Guide* for more information on **mkdev serial**.

NOTE If you are installing a "smart" or "intelligent" multiport card (such as the Arnet Smartport card), do not use **mkdev serial** to configure your card. The manufacturer provides configuration software that is **custom(ADM)**-installable. Consult your hardware documentation for additional information.

Each multiport serial I/O board is unique; SCO UNIX System V has special driver code for each card listed. Only those with status poll registers can work with the high performance driver scheme chosen, and new boards require additional driver support.

Refer to the **serial(HW)** and **mkdev(ADM)** manual pages for more information on compatible serial I/O cards and on adding and enabling serial lines.

Serial I/O chip notes

Some computers or add-on serial I/O cards use the 8250a serial I/O chip. Some revisions of this chip do not handle interrupts properly. MS-DOS does not use interrupts, so the use of this chip with MS-DOS causes no problems. SCO UNIX System V makes use of interrupts, as it is a multitasking operating system.

The problem with the serial I/O chip shows up when using **uucp(C)** or **cu(C)**. Indications that your computer contains a bad revision 8250a chip are that **uucp(C)** may lose characters constantly and generate unkillable **uucico** processes, and that **cu(C)** at high baud rates stops executing and does not exit.

The problem rarely shows up when using the serial port with a terminal. It is associated with high-speed serial input. If you want to use **uucp(C)** or **cu(C)** and your computer has one of these chips, we recommend you replace the 8250a chip with an 8250b serial I/O chip or use a multi-function card containing a serial port and configure it as COM1 or COM2. Disable the built-in serial port or avoid high-speed input on that port.

16450 and 16550 chips are strongly recommended for 386 machines. The 16550 chip has FIFO support.

All COM1 boards should be strapped at Interrupt Vector 4. All COM2 boards should be strapped at Interrupt Vector 3. Check your serial card hardware manual or call the hardware manufacturer for the switch settings that implement these addresses.

NOTE SCO uniPATH SNA-3270 uses Interrupt Vector 3, which can interfere with the use of a serial card on COM2.

Serial cards on Standard Architecture

The following serial I/O boards are supported by SCO UNIX System V for computers based on Industry Standard Architecture:

- AMI Lamb 4 and 8 port
- Arnet 4 and 8 port (clock option not supported)
- Arnet TwinPort
- AST FourPORT/XN
- Chase DB4
- Chase DB8
- Control Corporation Systems Hostess (4 port)
- Control Corporation Systems Hostess/550 (8 port)
- CTC Versanet 4AT (4 port) and 8AT (8 port)
- Digiboard 4 and 8 port
- IBM standard COM1 and COM2
- Olivetti RS232C Multiport Board
- Quadram QuadPort™ 1 and 5 port
- Specialix 1/04 (4 port card)
- Stallion Technologies ONboard/D
- Stargate Technologies OC4400 (4 port) and OC8000 (8 port)
- Tandon Quad Serial Card

We strongly recommend that multiport cards use 16450 or 16550 serial I/O chips instead of the slower 8250 chips. If you see a “double echo” problem, it is due to slow serial I/O hardware.

Serial card addresses and notes

Physical Port	Board Type	Number of Ports	Primary Address Range	Alternate Address Range	Primary Status Address	Alternate Status Address
COM1	AMI lamb**	8	0x540-0x57F	n/a	0x210	n/a
	AMI lamb**	4	0x540-0x55F	n/a	0x210	n/a
	Arnet	8	0x100-0x13F	0x280-0x2BF	0x142	0x2C2
	Arnet	4	0x100-0x11F	0x280-0x29F	0x142	0x2C2
	Arnet	2	0x100-0x10F	0x280-0x28F	0x142	0x2C2
	AST*	4	0x2A0-0x2BF	n/a	0x2BF	n/a
	CTC†	8	0x160-0x19F	n/a	0x167	n/a
	CTC†	4	0x160-0x17F	n/a	0x167	n/a
	Digiboard††	8	0x110-0x14F	n/a	0x151	n/a
	Digiboard††	4	0x110-0x12F	n/a	0x151	n/a
	Hostess	8	0x140-0x17F	0x500-0x6BF	0x147	0x687
	Hostess	4	0x140-0x15F	0x680-0x69F	0x147	0x687
	Kimtron	4	0x120-0x13F	n/a	0x8120	n/a
	Olivetti†††	4	0x2A0-0x2BF	n/a	0x2BF	n/a
	Quadram***	5	0x280-0x2CF	n/a	0x2D3	n/a
	Quadram***	1	0x280-0x28F	n/a	0x2D3	n/a
	Stallion	8	0x118-0x157	n/a	0x110	n/a
	Stargate	8	0x290-0x2CF	n/a	0x2D0	n/a
	Stargate	4	0x290-0x2AF	n/a	0x2D0	n/a
	Tandon***	4	0x2A0-0x2BF	n/a	0x2A2	n/a
COM2	AMI lamb**	8	0x2C0-0x2FF	n/a	0x212	n/a
	AMI lamb**	4	0x2C0-0x2DF	n/a	0x212	n/a
	Arnet	8	0x180-0x1BF	0x300-0x33F	0x1C2	0x342
	Arnet	4	0x180-0x19F	0x300-0x31F	0x1C2	0x342
	Arnet	2	0x180-0x18F	0x300-0x30F	0x1C2	0x342
	AST*	4	0x1A0-0x1BF	n/a	0x1BF	n/a
	Chase DB8	8	0x100-0x13F	0x280-0x2BF	0x140	0x2C0
	Chase DB4	4	0x100-0x11F	0x280-0x29F	0x140	0x2C0
	CTC†	8	0x218-0x257	n/a	0x21F	n/a
	CTC†	4	0x218-0x237	n/a	0x21F	n/a
	Chase DB8	8	0x180-0x1BF	0x300-0x33F	0x1C0	0x340
	Chase DB4	4	0x180-0x19F	0x300-0x31F	0x1C0	0x340
	Digiboard††	8	0x210-0x24F	n/a	0x250	n/a
	Digiboard††	4	0x210-0x22F	n/a	0x250	n/a
	Hostess	8	0x200-0x23F	0x580-0x5BF	0x207	0x587
	Hostess	4	0x200-0x21F	0x700-0x71F	0x207	0x707
	Kimtron	4	0x2E0-0x2FF	n/a	0x82E0	n/a
	Olivetti†††	4	0x1A0-0x1BF	n/a	0x1BF	n/a
	Quadram***	5	0x288-0x2D7	n/a	0x2DB	n/a
	Quadram***	1	0x288-0x297	n/a	0x2DB	n/a
	Stallion	8	0x218-0x257	n/a	0x210	n/a
	Stargate	8	0x190-0x1CF	n/a	0x1D0	n/a
	Stargate	4	0x190-0x1AF	n/a	0x1D0	n/a
	Tandon***	4	0x280-0x29F	n/a	0x282	n/a

* Only enhanced mode is supported. Do not use the AST driver.

**

Only continuous mode is supported.

Tandon is the only card whose I/O addresses are potentially identical with other supported cards, such as the AST and Quadram serial cards.

Because card addresses must not overlap in the same systems, if you have both a Tandon and a Quadram, COM1 and the Quadram must be on COM2.

You can use the following Quadram serial expansion cards in these configurations under SCO UNIX System V:

COM1	COM2
5-port	-
1-port	-
-	5-port
-	1-port
5-port	1-port

† Notes for the CTC Versanet serial cards:

1. The correct switch settings for the 8AT and 4AT are:

As a COM1 (strapped at addr 0x160, using irq4) the 8AT has:
switches 33, 35, 36, 38, 39 & 40 OFF
switches 34, 37 ON (that is, shunted)

on the DIPSWITCH selection:
5, 6 & 8 should be OFF
all the others should be ON

As a COM2 (strapped at addr 0x218, using irq3) the 8AT has:
switches 33, 35-40 OFF
switch 34 ON (that is, shunted)

on the DIPSWITCH selection:
1, 2 & 7 should be OFF
all the others should be ON

The 4AT is the same as the 8AT in both the above cases, with the following common exception:
switches 39 & 40 MUST BE ON (shunted)

2. These boards come in both 8250 and 16450 versions. You must have the 16450 version.
3. The original CTC Versanet boards used different addresses. Please ask your hardware vendor for Versanet boards strapping at the above addresses (0x160 and 0x218).
4. The CTC "Maomao-4" serial board is not supported.

++ Notes on the Digiboard serial card:

1. Ports for switches DS2 to DS5 (DS9 for 8 port version) must be strapped starting at the board's base address as given in the table and incrementing by 8 for each port.

The following example is for COM1 at 110:

DS2	110
DS3	118
DS4	120
DS5	128
DS6	130
DS7	138
DS8	140
DS9	148
DS1	150

2. If COM1 is used, then all the ports must be strapped as "EVEN" to interrupt request line 4 (see Digiboard documentation). If COM2 is used, then all the ports must be strapped as "ODD" to interrupt request line 3 (same notation).
3. Only rev. C and later boards are supported.

+++ Notes for the Olivetti RS232C Multiport board:

1. The factory settings do not function properly. You must alter the existing switch positions to reflect those listed in item 4 below.
2. If you are using a single Olivetti board, you must configure it as COM2.
3. If you are using two Olivetti boards, one must be configured as COM2 and the other configured as COM1, with the COM1 port built into the M380 disabled. To disable the COM1 port built into the M380, refer to the section on "Setting Up the System" in your Olivetti *Installation and Operations Guide*.
4. The correct switch settings:

As a COM1 (strapped at addr 0x2A0):

IRQ2	IRQ3	IRQ4	IRQ5	IRQ6	IRQ7	XA1	XA0	INT	SHR
off	off	on	off	off	off	off	on	on	off

As a COM2 (strapped at addr 0x1A0):

IRQ2	IRQ3	IRQ4	IRQ5	IRQ6	IRQ7	XA1	XA0	INT	SHR
off	on	off	off	off	off	off	off	on	off

Serial cards on Micro Channel Architecture

The following serial cards are supported under SCO UNIX System V for Micro Channel Architecture machines:

- Arnet MultiPort 8 Micro Channel
- AST 4 port or 8 port Async Cluster Adaptor
- Control Hostess/MC 4 port
- Control Hostess 550/MC 8 port
- Digiboard PS-COM/8 port or 16 port
- Digiboard MC/4
- Digiboard MC/8
- Digiboard MC/16
- IBM PS/2 model 3033 dual async 2 port card (up to 3 per system)
- Stargate PLUS 8 MC

Serial card addresses and notes

Physical Port	Board Type	Base Number of ports	Address
COM1	Motherboard	1	0x3F8
COM2	Arnet*	16	0x140
	AST	4	0x2F8
	Digiboard	16	0x3000
	Digiboard	8	0xDB80
	HostessMC	4	0x500
	HostessMC	8	0x500
	HostessMC	4	0x540
	HostessMC	8	0x540
	HostessMC	4	0x580
	HostessMC	8	0x580
	IBM	2	0x2F8
	Stargate**	8	0x400

* You must use the reference disk to modify the Optional I/O Address Block to be 0108-018F hexadecimal.

** On the Apricot Qi, the Stargate serial adapter card clashes with the Ethernet Controller start address. To resolve the problem, use the reference disk to modify the Ethernet Controller start address. Choose the menu options in the following sequence:

- Configuration
- Change
- Internal Ethernet Controller
- Port Address
- Alternate #7

Dumb boards on COM2 such as the Hostess, AST 4 port, and the IBM Dual Async occupy addresses as shown in the table below:

Port Number	Address
1	0x2F8
2	0x3220
3	0x3228
4	0x4220
5	0x4228
6	0x5220
7	0x5228
8	0x2F0

When installing between 1-3 IBM Dual Asynchronous boards, you should select the 8-port option.

Modems and autodialing

Any 100% Hayes-compatible modem works using `uucp(C)` and `cu(C)`. The default autodialer is for the Hayes Smartmodem 1200. Support is limited to external modems only. Autodial programs are also supplied for the following:

- Dowty/Telebit Trailblazer,
- Hayes Smartmodem 1200, 2400 and V-Series 9600
- MultiTech Multimodem 224EM.
- Racal Vadic 9600VP, 3451, 212

Other autodialing modems can be supported by writing a dialer program, or modifying an existing one in `/usr/lib/uucp`.

In addition, the Honey DanBer UUCP package includes a large number of dialers in the *Dialers* file. However, dialer binaries are preferred for greater reliability.

Supported high-speed modems are

- Hayes Ultra 96-2000
- MICC 9610
- MULTITECH MT932EA
- Telebit T2500
- U.S. Robotics Gowne V.32

See the “Using modems” chapter of the *System Administrator's Guide* for more information on writing other dialer programs.

NOTE Only external modems using COM1 and COM2 are supported by SCO.

Multi-function cards

The serial ports on many multi-function cards behave as expected if COM1 and COM2 are fully compatible with the standard specifications for these serial ports. Memory, parallel ports, and other hardware usually function as expected.

Typical device interrupts

Interrupt	Device
0*	Clock
1*	Console
2	Networks, Tapes or mouse
3	Serial COM2, Tapes or mouse
4	Serial COM1
5	Alternate Parallel Port (lp2), Tapes or mouse
6*	Floppy Disk
7	Main Parallel Port (lp0 or lp1)



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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	☐	☐	☐	☐	☐	☐
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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 _____

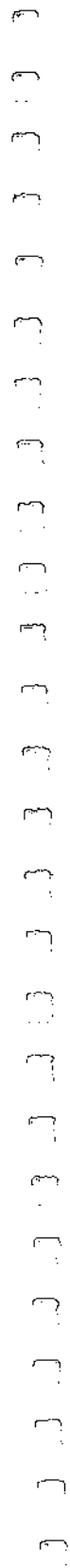
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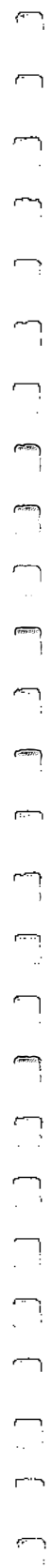
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