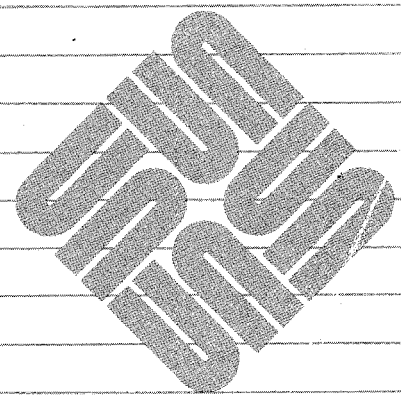
sun microsystems

Release 1.4 Manual

for the Sun Workstation



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READ THIS FIRST – SOFTWARE

Notes for Release 1.4 and 1.4U

March 18, 1985

Introduction

The 1.4 release fixes various bugs and adds support for the Sun-2/160 workstation, otherwise it is compatible with prior releases in the 1.X software series. Existing 1.1 documentation applies to 1.4 except where superseded by the *Release 1.4 Manual*.

Release 1.4 is available in two forms, as a full release tape called 1.4, and as an update release tape called 1.4U. The 1.4U form of the release updates systems running the 1.1, 1.2, or 1.3 releases, bringing them up to the equivalent of the 1.4 full release. 1.4U does not update systems running 0.3, 0.4, or 1.0 releases (these releases are no longer supported).

The full release version of 1.4 is shipped with new workstations, and the update version, 1.4U, is shipped to customers with support agreements covering software. The 1.4U tape can also be ordered from Sun for $250 per licensed workstation. Call Connie Humphries, (415)960-2764, for information.

Should you have software or hardware questions while installing 1.4, call (415) 960-3500. Have your system's model and serial numbers ready to give the dispatcher. If you have questions about your shipment (eg, missing items), call your sales representative. Software bugs can be reported by sending a description electronically to *sun!sunbugs*, or by U.S. Mail to Technical Support MS-2/30, Sun Microsystems, 2550 Garcia Ave, Mtn View, CA, 94043.

New Workstations

Install the 1.4 full release according to the instructions in the *Release 1.4 Manual*, being careful to note the changes documented in the 1.4 errata pages.

Existing Workstations

On workstations running 1.1, 1.2 or 1.3, begin installing 1.4U by reading chapter 1 of the *Release 1.4 Manual* and proceeding with the installation steps in chapter 2. There is no need to install 1.2 or 1.3 before 1.4U (1.4U is a cumulative update).

If your workstation IS NOT running 1.1, 1.2 or 1.3, call Technical Support, (415)960-3500, for additional information about installing 1.4.

Known Problems in 1.4

The following are some of the known problems in Release 1.4.

Determining the type of 85MB disk in a workstation.

On systems with 85MB disks, before running *diag*, you need to know the type of 85MB disk drive. The type of 85MB drive (Fujitsu, Micropolis, or Vertex) will be shown on a label behind the front cover of the machine. If no label is present, assume the disk is a Fujitsu.

Compatibility of 20MB and 45MB tapes.

Tapes written on the 20MB and 45MB tape drives are not guaranteed to be interchangeable. Generally, tapes written on 20MB drives can be read on 45MB drive when the tape is correctly tensioned. There is no assurance that tapes written on 45MB cartridge drives will read on 20MB drives.

To retension tapes, use the *mt ret* command. Alternatively, on machines with Rev Q or later proms, the *b* (boot) command will first retension a tape when 100 is added to the tape file number. For example, use *b st(0,0,100)* to retension the tape and boot file 0 from the st drive.

The Sun–2/50 and Sun–2/160 are more sensitive to Ethernet™ problems.

The Sun–2/50 and Sun–2/160 are designed to be used with level 1 Ethernet transceivers, like the 3Com™ transceivers supplied by Sun. Level 2 transceivers, like the DEC™ DELNI, *may* work when the cpu board jumper located next to the 24–pin MB502 chip by the transceiver cable connector is removed. Sun, however, does not support this.

usercore77.h misnamed as *f77*.

This affects the compilation of Fortran programs using SunCore™. Correct this with the command, *mv /usr/include/f77 /usr/include/usercore77.h*.

Corrections to the *Release 1.4 Manual*.

Systems with 1/4" should use the *mt –f /dev/nrtape0 rew* command before running *1.4_upgrade* (page 2–5).

On page 2–7, the line *tar xvpf /dev/nrtape0 { man | demo }* should read *tar xvpf /dev/nrtape0 { ./man | ./demo }*.

If you are using 1/4" tape, skip section 2.6 and use appendix A for loading optional software.

Leaving SunWindows on the Sun–2/160.

A 'ghost' image of the window system may be left behind when SunWindows is exited. Fix this with the *clear –c* command. See the *clear* manual page in the *Release 1.4 Manual*.

zs serial port problems.

Various problems exist with the *zs* serial port driver.

Degaussing color monitors.

Keep magnetic tapes away from color monitors, particularly during degaussing.

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For: Sun System Release 1.4

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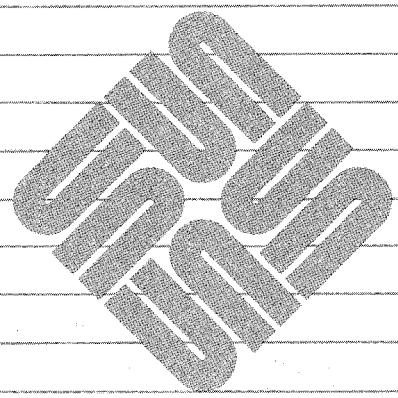
Release 1.4 Manual

for the Sun Workstation



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Revision History

Revision	Date	Comments
A	5th November 1984	First release of this 1.4 Manual.
B	22nd January 1985	Added one erratum and notes on new version of ***tip***.
C	7th February 1985	Added new ***diag*** chapter, additional new man pages, bug fixes for GENERIC, notes on new tape reorganization and new installation procedures for optional software.

Contents

Contents

Chapter 1

Introduction

This document describes the content of the Sun UNIX 1.4 incremental software release; gives instructions for installing the 1.4U release tape on systems currently running the Sun UNIX Version 1.1, 1.2, or 1.3 releases; discusses, briefly, the major software changes between each of these releases (major bug fixes and enhancements); and, finally, includes documentation — errata pages and new insert pages for your 1.1 manuals — which reflects these major changes.

1.1. Summary of Contents

Chapter 1: Introduction
You're reading it.

Chapter 2: Installing the 1.4 Release
Provides instructions for installing 1.4 on systems currently running the Sun 1.1, 1.2, or 1.3 Release software.

Chapter 3: Using the New *diag* to Format and Label Disks
Gives instructions for use of the new version of *diag*, the disk formatting and labeling utility, which is part of the 1.4 Release distribution. This new version supports several new SCSI 85 MByte drives (the Micropolis 1325, the Fujitsu M2243AS, and the Vertex V185), as well as providing enhanced diagnostic capabilities.

Chapter 4: Changes from the 1.1 Release Software
Discusses differences between Releases 1.1 and 1.2: fixes and enhancements. This chapter is identical to Chapter 4 of the 1.2 and 1.3 Manuals.

Chapter 5: Changes from the 1.2 Release Software
Discusses differences between Releases 1.2 and 1.3. This chapter is identical to Chapter 5 of the 1.3 Manual.

Chapter 6: Changes from the 1.3 Release Software
Discusses differences between Releases 1.3 and 1.4.

Chapter 7: Errata Pages for 1.1 System Manager's Manuals
Contains errata pages for the Sun *System Manager's Manual for the Sun Workstation: Models 100U/150U* and the *System Manager's Manual for the Sun Workstation: Models 120/170.* Please read the pages from the manual(s) relevant to your system configuration, and note the errors in your 1.1 Manuals.

Chapter 8: Insert Pages for 1.1 Reference Manuals
Contains a few new pages which you can (copy if necessary and) insert into your 1.1 Sun Manuals.

Several of these pages were released with 1.2: *as*(1), *cc*(1), *cpp*(1), *screendump*(1), *screenload*(1), *malloc*(3), *zs*(4S), *acct*(5), *utmp*(5), *skyversion*(8), and *dkinfo*(8). These pages either describe new facilities, have been revised, or were mistakenly omitted from the 1.1 manuals.

Several pages are new with this release: ***bessel***(3F), ***bit***(3F), ***time***(3F), ***rand***(3F), ***etime***(3F), ***fdate***(3F), ***stat***(3F), and ***long***(3F). These pages were omitted from the FORTRAN Library Functions Section of the 1.1 *FORTRAN and Pascal* Manual. A new ***mem***(4S) page is included which describes changes made for Sun-2/160 support. New pages for ***cgtwo***(4S), ***clear***(1), ***diag***(8S), ***ie***(4S), ***ftpusers***(5), ***mt***(1), and ***tip***(1C) reflecting software enhancements are also included.

Chapter 2

Installing the 1.4 Release

In this chapter, we give directions for installing the Sun 1.4U incremental release software on a Sun system currently running the 1.1, 1.2, or 1.3 Releases.

PLEASE NOTE: If you are installing a complete 1.4 distribution rather than an upgrade, do not use the instructions in this chapter for installation. You should, in general, follow the instructions given in the ***Installing UNIX for the First Time*** chapter of the 1.1 Release ***System Manager's Manual for the Sun Workstation***. You should have received this manual with your distribution tape(s). Exceptions to the procedures given in that manual are:

1) You have no doubt noticed, if you have opened the manual, that the distribution has grown from two to three 1/4" tape cartridges. This affects only one part of the installation procedure: loading optional software (the online manual pages, demonstration programs, games, and ***vfont*** files) to your disk. Appendix A of this manual gives an outline of what is on your tapes, and new procedures for loading optional software.

2) Use the instructions in Chapter 3 of this manual, ***Using the New diag to Format and Label Disks***, to prepare any new disks.

3) Use the procedures in the final sections of this chapter for kernel configuration (since they are more accurate than the description given in the 1.1 Manual because of updates made to the *GENERIC* system configuration file for Sun-2/160 support).

4) Finally, read through the chapters of this manual describing errata, since these will affect you.

The directions below assume you are working with the incremental release software on either one 1/4" or 1/2" tape, and support installation on

- Standalone machines with local tape and disk, which can read in the distribution tape via the local tape drive;
- Machines with a local disk, but no local tape drive, that are on a network. Such machines will use the tape drive on another machine (called ***remote_host*** or ***server_name*** in the procedures) to read the tape;
- Server machines with local tape and disk and with diskless clients, which will use the local drive to install both the server and its clients.

Before beginning installation, there are several important things you should be aware of:

- You must have **at least** 300 KBytes of disk space available on your root partition, and 800 KBytes available on your */usr* partition to do this installation. If you wish to load the optional software included on the tape (manual pages and demonstration executables and source), allow another 4.2 MBytes on */usr* (100KBytes for the pages, and 4.1 MBytes for the demos).

  You can use the *df*(1) command to check your available space. For example:

```
cronin% df
Filesystem    kbytes    used   avail capacity  Mounted on
/dev/xy0a       7437    5470    1223    82%    /
/dev/xy0h      148455  128709    4900    96%    /usr
/dev/xy0g      117327   66896   38698    63%    /usr/misc
[and so on]
```

- If you are installing a new disk, you **must** follow the directions in Chapter 3 of this document for formatting and labelling it.
- This maintenance release is for installation only on systems running the Sun Version 1.1, 1.2, or 1.3 Release software. This release is **incremental** in the sense that **you need not re-install the complete operating system**. We strongly recommend at least scanning Chapters 4, 5, and 6, which describe deltas in the software, before installing this release, to see how it will affect your Sun Workstation(s) and your software.
- This release is intended for installation as a package; you must install the entire release. Sun will not provide direct support for users who wish to install selected portions of the release software.
- You can 'de-install' this release if you have to: a facility has been provided with the release for backing out changes. In most circumstances, you should not find this necessary; however, if you do, please inform Sun Microsystems Technical Support — we'd like to know what went wrong.
- You must build and install a new operating system kernel to complete the installation of the 1.4 release.
- **We strongly advise a thorough back-up before beginning installation.**

2.1. What is on the Distribution Tape?

Distribution of the 1.4U Release binaries is either on a 1/4" magnetic tape cartridge or a 1/2" nine-track tape. The tapes contain eight files, as follows:

File 1: Boot block.
A general-purpose boot program which knows how to boot from the various devices that can be attached to the Sun Workstation. The PROM monitor boots this general-purpose boot program.

File 2: Bootable *diag* program.
This is a new version of *diag*, the disk formatting and labelling program; this version has enhanced diagnostic capabilities and supports a wider range of disks. For more information on changes in this version, see Chapter 3, ***Using the New diag to Format and Label Disks.***

File 3: Copyright file.

File 4: *tar* file of the installation utility.
A script which handles both installation and (if necessary) 'un-installation' of any incremental release.

File 5: *tar* file of replacement 1.4 binaries.
A *tar* format file of the replacement 1.4 object files, executable files, and libraries.

File 6: *tar* file of 1.1 binaries.
A backup version of the binaries replaced by File 5 of the tape, in case you need to back out the 1.4 changes.

File 7: *tar* file of optional software.
With 1.4, this includes several new/revised manual pages and new color demos. The manual pages are also included in Chapter 8 of this manual.

File 8: Copyright file.

2.2. Overview of the Installation Procedure

The object of this exercise is to load the Release 1.4 binaries from the magnetic tape onto your local or network disk subsystem.

The basic steps in installation are:

1. Load the tape.
2. Load the 1.4 installation utility.
3. If you are installing a server, halt any diskless clients.
4. Run the installation utility.
5. Optionally, use the *tar*(1) command to extract the manual pages and/or color demos.
6. Reconfigure your system kernel.

If you have performed an installation of a Sun system before, you will recall that we use several conventions in the procedures and examples to try and clarify things:

- What the system types at you is printed in `typewriter font like this`.
- What you type at the system is shown in **`boldface typewriter font like this`**. Everything shown in boldface should be typed exactly as it appears.
- Where parts of a command are shown in ***italic text like this***, they refer to a variable which you have to substitute from a selection; it is up to you to make the proper substitution.

One very important variable in the examples is ***tape***, which should be replaced with the UNIX device name for your tape:

Abbreviation	*Tape Device*
ar	Archive quarter-inch tape
mt	Nine-track magnetic tape
st	SCSI tape controller

For example, a common configuration would load from a quarter-inch magnetic tape cartridge via a SCSI tape controller. In this case, ***tape*** would be replaced by **st** (**S**CSI **T**ape) everywhere.

Now, you are ready to begin the actual installation.

2.3. Load the Tape

PLEASE NOTE: If you are installing 1.4 on a network disk server, you **must** have a tape drive on the server machine.

PLEASE NOTE: We do not guarantee full compatibility between the 4-track 20 MByte and the 9-track 45 MByte drives.

Your chances of successfully reading tapes produced by a different type of drive are increased if you follow the manufacturer's instructions for drive maintenance: clean the drive heads after every use of a new tape and after every eight hours of use.

This release contains a new ***mt*** with retensioning capability which also helps solve compatibility problems. Once you are running the release, please use the retensioning capability before writing a tape. See the ***mt***(1) page included in Chapter 8 of this manual for instructions.

In the case of the nine-track tape, load the tape onto the tape drive and put the drive on-line.

For a quarter-inch cartridge, hold the cartridge so that the little window with the word "SAFE" in it is at the top left-hand corner. To insert the tape, firmly push the cartridge into the slot in the front of the tape drive. The tape will suddenly go all the way in with a definite "click". The tape is now ready for use.

2.4. Extract 1.4 Installation Utility from Tape

When you have loaded the tape, become super-user and use the ***tar***(1) command to extract the 1.4 installation utility.

- **If you are using a local tape drive**, do the following. Remember to replace ***tape*** with the appropriate device abbreviation for your tape (**ar** for the Archive drive, **st** for a SCSI tape drive, or **mt** for the nine-track tape):

```
gaia% su
Password: Type the root password here
gaia# cd /usr/etc
gaia# mt -f /dev/nrtape0 rew
gaia# mt -f /dev/nrtape0 fsf 3
gaia# tar xvpf /dev/nrtape0
x 1.4_upgrade, 5075 bytes, 10 tape blocks
gaia#
```

- **If you are using a remote tape drive**, do the following. Note that, since you are performing a remote process as super-user, the hostname of the local machine (which you are typing commands on) must be in the remote machine's ***/.rhosts*** file to avoid permission problems. In addition, each machine must have an entry for the other (name and Internet

address) in its */etc/hosts* file. Remember to replace *tape* with the appropriate device abbreviation for the remote tape drive you are using, to replace *remote_host* with the hostname of the machine this tape drive is attached to, and to replace *block_size* with **20b** for a 1/2" tape or **126b** for a 1/4" tape:

```
gaia% su
Password: Type the root password here
gaia# cd /usr/etc
gaia# rsh remote_host mt -f /dev/nrtape0 rew
gaia# rsh remote_host mt -f /dev/nrtape0 fsf 3
gaia# rsh remote_host dd if=/dev/nrtape0 bs=block_size | tar xvpBf -
x 1.4_upgrade, 5075 bytes, 10 tape blocks
gaia#
```

If you get a "`Broken pipe`" message when you run the last command, you can ignore it.

2.5. Run the 1.4 Installation Utility

PLEASE NOTE: If you are installing 1.4 on a disk server, you **must** halt all diskless clients of this server before beginning the procedures in this section.

ALSO: Do not run SunWindows during the installation procedure.

Next, you run the 1.4 installation utility to extract the 1.4 files from the release tape. This process takes about 10 minutes.

If you are doing the installation on a server, note that the installation utility takes care of 1.4 installation on your diskless clients, but that it assumes a canonical form of the *nd* configuration file */etc/nd.local* in order to do so. In particular, if there are lines in the server's */etc/nd.local* for client partitions which are commented out (lines with a leading '#'), these clients will **not** have 1.4 installed on them. If you wish to have the 1.4 Release installed on these clients, you must remove the comment symbol from their lines in the file before performing installation on the server. If you do not do this during the initial install, you will have to run through the entire installation procedure again (on the server and all the clients) in order to bring the commented-out client partitions up to date.

Also, if your */etc/nd.local* file has `user...` lines and/or `ether ...` lines that refer to non-existent clients, comment out these lines before running the installation utility. Again, the utility will not run to completion if this is not done.

To run the utility, type the following command, using only **one** of each set of terms in braces. The first set of terms allows you to decide whether to install or back out the 1.4 binaries; the second set specifies your tape device; and the last designates your machine as a server, standalone with tape drive, or Workstation without a tape drive using a another machine's (*server_name*'s) tape drive (the command is printed on two lines for formatting purposes only; type it as a single line):

```
gaia# 1.4_upgrade {install|uninstall} {ar|mt|st}
            {server|tapefull|tapeless server_name}
```

For example, the installation command and system response for a server machine with a half-inch tape drive would look like this:

```
cronin# 1.4_upgrade install mt server

Beginning 1.4 install.

Extracting 1.4 object files.
x ./usr/lib/vpltdmp, 18432 bytes, 36 tape blocks
x ./usr/lib/f77pass1, 200704 bytes, 392 tape blocks
x ./usr/lib/libF77.a, 60602 bytes, 119 tape blocks
x ./usr/lib/libF77_p.a, 67284 bytes, 132 tape blocks

[ and so on . . . extraction takes about half an hour . . . ]

x ./sys/sys/init_sysent.c, 8530 bytes, 17 tape blocks
x ./sys/sys/tty_conf.c, 2158 bytes, 5 tape blocks
x ./sys/sys/uipc_proto.c, 810 bytes, 2 tape blocks
x ./sys/machine symbolic link to sun
x ./boot, 23552 bytes, 46 tape blocks

Installing new bootable code on server.

Beginning 1.4 install on diskless clients.

Beginning 1.4 install on client client_1.

Completed 1.4 install on client client_1.

Beginning 1.4 install on client client_2.

Completed 1.4 install on client client_2.

Beginning 1.4 install on client client_3.

Completed 1.4 install on client client_3.

Completed 1.4 install on diskless clients.

Installing new sky microcode.

Running ranlib on new libraries.

Applying patches to object code.

1.4 install completed.
You should now reconfigure and rebuild your kernel.
```

Note: if you are using a SCSI tape for the install, you may get a message like "`/dev/nrst0 rewind 1 failed: I/O error`" at the end of the install script. You can ignore it.

To install the release on my machine ('gaia'), which is a tapeless Workstation using the 1/4" SCSI tape drive on a machine named 'hal', the command line would be:

```
gaia# 1.4_upgrade install st tapeless hal
```

2.6. Loading Optional Software from the Release Tape

The seventh file on the upgrade tape contains new/revised manual pages and several new color demos (source and executables); you may load the pages and/or demos if you desire.

Manual pages take approximately 97 KBytes of storage. Pages are:

Also included in 1.2 and 1.3:
as(1), *cc*(1), *cpp*(1), *screendump*(1), *screenload*(1), *malloc*(3), *zs*(4S), *acct*(5), *utmp*(5), *skyversion*(8), and *dkinfo*(8).

New in 1.4:
clear(1), *diag*(8S), *mt*(1), *tip*(1C), *bessel*(3F), *bit*(3F), *time*(3F), *rand*(3F), *etime*(3F), *fdate*(3F), *stat*(3F), *long*(3F), *cgtwo*(4S), *ie*(4S), *mem*(4S), and *ftpusers*(5).

Demos take approximately 4.1 MBytes of space. They are:

In *demo/src*:
draw.c, shaded.c, showmap.c, stringart.c, suncube.c, shademo.c, rotcube.c, molecule.c, cframedemo.c, demolib.h, Makefile, show.c.

In *demo*:
MAPS/, DATA/, globeframes/, READ_ME, cframedemo, shaded, draw, molecule, shademo, showmap, stringart, suncube, COLORPIX, show.

Use *tar*(1) to extract the pages and/or demos as follows. If you want to load the pages **or** the demos (not both), use the appropriate command line argument to *tar*; if you omit the argument(s), *tar* loads both the pages and demos. The complete load takes about 5 minutes.

For a machine with a local tape drive:

```
gaia# cd /usr
gaia# mt -f /dev/nrtape0 rew
gaia# mt -f /dev/nrtape0 fsf 6
gaia# tar xvpf /dev/nrtape0 { man | demo }
gaia# mt -f /dev/nrtape0 rew
```

For a machine using a remote tape drive, type the following. Remember to replace *tape* with the appropriate device abbreviation for the remote tape drive you are using, to replace *remote_host* with the hostname of the machine this tape drive is attached to, and to replace *block_size* with **20b** for a 1/2" tape or **126b** for a 1/4" tape:

```
gaia# cd /usr
gaia# rsh remote_host mt -f /dev/nrtape0 rew
gaia# rsh remote_host mt -f /dev/nrtape0 fsf 6
gaia# rsh remote_host dd if=/dev/nrtape0 bs=block_size | tar xvpBf - { man | demo }
gaia# rsh remote_host mt -f /dev/nrtape0 rew
```

The *dd* command above will print the number of records read in and written out, for example:

```
6 + 0 records in
6 + 0 records out
```

This message may be interspersed with the *tar* output and, in any case, may be ignored. Also, you can ignore the "`Broken pipe`" message delivered by the *tar*.

If you load the pages, and normally use *catman*(8) to create pre-formatted copies of your online manual pages, then don't forget to re-issue the *catman* command for the new 1.4 pages. If you are installing a server, you must do this before re-booting your clients.

2.7. Reconfigure your UNIX System Kernel

Finally, to complete the 1.4 Release installation, you must reconfigure your system kernel.

PLEASE NOTE: Substantive changes have been made to the device description lines in the kernel configuration file to allow for Sun-2/50 and Sun-2/160 support; therefore **all systems must begin by editing the new *sys/conf/GENERIC* file**. Do not use your old system configuration file.

If you are doing kernel configuration for the first time, you can use the procedures in the 1.1 System Manager's Manual to help you along. See the Chapter ***Installing UNIX for the First Time***, the sections beginning with ***Kernel Configuration.***

If you have previously configured a kernel, you can use the following sections to guide you through reconfiguration. The first subsection is an annotated copy of the new *GENERIC* file; please read it carefully to make sure you are including the correct device description lines for your system. The second subsection gives reconfiguration procedures for standalone machines, and the third subsection addresses servers.

2.7.1. Kernel Reconfiguration — an Annotated Copy of GENERIC

The following pages provide an annotated copy of the *GENERIC* file shipped with this distribution. You can use the explanations of each line in the file to determine which lines should be included in your own system configuration file.

```
#
# GENERIC SUN
#
machine   sun
```
[mandatory.]

```
cpu       "SUN2"
```
[mandatory.]

```
ident     GENERIC
```
[**mandatory.** If you use "GENERIC" as your system identifier, you may use the "swap generic" clause in the "config" line below. If you customize the identifier to *SYS_NAME*, you must either include an "options GENERIC" line, or specify at least the device where your root file system lives in place of "swap generic". For example, the "config" line for a standard Sun-2 might read: "config vmunix root on xy". See *General* and *Specific System Description Lines*, above, for information.Finally, if *SYS_NAME* contains both alpha and numeric characters (as in, for example, SDST120), you must enclose the name in double quotes ("SDST120") or you will get a syntax error when you run */etc/config.*]

```
timezone  8 dst
```
[**mandatory.** Specifies your timezone. Adjust value accordingly.]

```
maxusers  4
```
[**mandatory.** Number may vary. For most systems, "2" is the proper value for maxusers. See the section *General System Description Lines*, above, for information.]

```
options   INET
```
[**mandatory.** Controls inclusion of Internet code – see *inet*(4). You must also include the "pseudo-device inet" and "pseudo-device loop" lines below.]

```
options   SYSACCT
```
[Controls inclusion of code to do process accounting — see *acct*(2) and *acct*(5). If you include this line, you must also include the "pseudo-device sysacct" line below.]

```
config    vmunix  swap generic
```
[**mandatory.** Specify kernelname and configuration clauses. Please see *Specific System Description Lines*,

above, for information.]

pseudo-device pty
[Pseudo-tty's. Needed for network or window system.]

pseudo-device bk
[Berknet line discipline for high speed tty input – see *bk*(4).]

pseudo-device sysacct
[See "options SYSACCT" line above.]

pseudo-device inet
[**mandatory.** See "options INET" line above.]

pseudo-device ether
[ARP code. Must include if using Ethernet – see *arp*(4).]

pseudo-device loop
[**mandatory.** Software loop back network device driver – see *lo*(4). Must include with 'options INET'.]

pseudo-device nd
[Network disk. Necessary for servers and diskless clients, and for machines serving as remote hosts for remote installation – see *nd*(4).]

pseudo-device win128
[Window system. Number indicates maximum windows. If you include this line, you must also include the "pseudo-device dtop", "ms", and "kb" lines just below.]

pseudo-device dtop4
[Maximum number of screens ('desktops'). Required for window system.]

pseudo-device ms3
[Maximum number of mice. Required for window system – see *ms*(4).]

pseudo-device kb3
[Maximum number of Sun keyboards. Required if using any Sun keyboard, and for the window system.]

pseudo-device ingres
[Sun MicroINGRES lock device.]

```
controller      mb0 at nexus ?
```
[**mandatory.** Main bus code.]

```
controller      ipc0 at mb0 csr all virt 0xeb0040 priority 2
```
[1st Interphase SMD disk controller – see *ip*(4).]

```
controller      ipc1 at mb0 csr all virt 0xeb0044 priority 2
```
[2nd Interphase controller.]

```
disk      ip0 at ipc0 drive 0
```
[1st disk on 1st Interphase controller.]

```
disk      ip1 at ipc0 drive 1
```
[2nd disk on 1st Interphase controller.]

```
disk      ip2 at ipc1 drive 0
```
[1st disk on 2nd Interphase controller.]

```
disk      ip3 at ipc1 drive 1
```
[2nd disk on 2nd Interphase controller.]

```
controller      xyc0 at mb0 csr all virt 0xebee40 priority 2 vector xyintr 72
```
[1st Xylogics SMD disk controller – see *xy*(4).]

```
controller      xyc1 at mb0 csr all virt 0xebee48 priority 2 vector xyintr 73
```
[2nd Xylogics controller.]

```
disk      xy0 at xyc0 drive 0
```
[1st disk on 1st Xylogics controller.]

```
disk        xy1 at xyc0 drive 1
```
[2nd disk on 1st Xylogics controller.]

```
disk        xy2 at xyc1 drive 0
```
[1st disk on 2nd Xylogics controller.]

```
disk        xy3 at xyc1 drive 1
```
[2nd disk on 2nd Xylogics controller.]

```
controller      sc0 at mb0 csr 0x80000 priority 2
```
[1st SCSI controller on a Sun-2/120 or Sun-2/170.]

```
controller      sc0 at mb0 csr vme busmem 0x200000 priority 2 vector scintr 64
```
[1st SCSI controller on a Sun-2/160.]

```
disk        sd0 at sc0 drive 0 flags 0
```
[1st disk on 1st SCSI controller.]

```
disk        sd1 at sc0 drive 1 flags 0
```
[2nd disk on 1st SCSI controller.]

```
tape        st0 at sc0 drive 32 flags 1
```
[SCSI tape.]

```
controller      sc1 at mb0 csr 0x84000 priority 2
```
[2nd SCSI controller.]

```
disk        sd2 at sc1 drive 0 flags 0
```
[1st disk on 2nd SCSI controller.]

```
disk        sd3 at sc1 drive 1 flags 0
```
[2nd disk on 2nd SCSI controller.]

```
tape        st1 at sc1 drive 32 flags 1
```
[SCSI tape.]

```
device      ropc0 at mb0 csr 0xee0800
```
[mandatory. Raster Op chip — see *ropc*(4).]

```
device      sky0 at mb0 csr 0x2000 priority 2
```
[Sky Floating Point board in any Sun-1, Sun-2/120, or Sun-2/170.]

```
device      sky0 at mb0 csr vme busio 0x8000 priority 2 vector skyintr 176
```
[Sky Floating Point board in a Sun-2/50 or Sun-2/160.]

```
device      zs0 at mb0 csr all virt 0xeec800 flags 3 priority 3
```
[CPU serial I/O ports — see *zs*(4).]

```
device      zs1 at mb0 csr all virt 0xeec000 flags 0x103 priority 3
```
[Sun-2 Video Board ports. Required for Sun-2 keyboard and mouse.]

```
device      zs2 at mb0 csr 0x80800 flags 3 priority 3
```
[1st two serial I/O ports on 1st SCSI Board.]

```
device      zs3 at mb0 csr 0x81000 flags 3 priority 3
```
[2nd two serial I/O ports on 1st SCSI Board.]

```
device      zs4 at mb0 csr 0x84800 flags 3 priority 3
```
[1st two serial I/O ports on 2nd SCSI Board.]

```
device      zs5 at mb0 csr 0x85000 flags 3 priority 3
```
[2nd two serial I/O ports on 2nd SCSI Board.]

```
device      mti0 at mb0 csr all virt 0xeb0620 flags 0xffff priority 4 vector mtiintr 136
```
[Systech terminal MUX — see *mti*(4).]

```
device      ie0 at mb0 csr 0x88000 priority 3
```
[1st Sun-2 Ethernet Controller on a Sun-2/120 or Sun-2/170.]

```
device      ie0 at mb0 csr vme virt 0x0ee3000 priority 3
```

[1st Sun-2 Ethernet Controller on a Sun-2/50 or Sun-2/160.]

```
device    ie1 at mb0 csr 0x8c000 flags 2 priority 3
```
[2nd Sun-2 Ethernet Controller on a Sun-2/120 or Sun-2/170.]

```
device    ec0 at mb0 csr 0xe0000 priority 3
```
[1st 3COM Ethernet Controller — see *ec*(4).]

```
device    ec1 at mb0 csr 0xe2000 priority 3
```
[2nd 3COM Ethernet Controller — see *ec*(4).]

```
controller      tm0 at mb0 csr all virt 0xeb00a0 priority 3 vector tmintr 96
```
[1st TAPEMASTER tape controller — see *tm*(4).]

```
controller      tm1 at mb0 csr all virt 0xeb00a2 priority 3 vector tmintr 97
```
[2nd TAPEMASTER tape controller — see *tm*(4).]

```
tape      mt0 at tm0 drive 0 flags 1
```
[1st 1/2" tape drive on 1st TAPEMASTER controller.]

```
tape      mt1 at tm1 drive 0 flags 1
```
[1st 1/2" tape drive on 2nd TAPEMASTER controller.]

```
device    ar0 at mb0 csr 0x200 priority 3
```
[1st 1/4" tape drive — see *ar*(4).]

```
device    ar1 at mb0 csr 0x208 priority 3
```
[2nd 1/4" tape drive.]

```
device    cgtwo0 at mb0 csr vme busmem 0x400000 priority 3
```
[Sun-2 color graphics interface — see *cgtwo*(4s).

```
device    cgone0 at mb0 csr 0xec000 priority 3
```
[Sun-1 Color Board — see *cgone*(4s).]

```
device    bwtwo0 at mb0 csr 0x700000 priority 4
```
[1st monochrome monitor on a Sun-2/120 or Sun-2/170 — see *bwtwo*(4s).]

```
device    bwtwo0 at mb0 csr vme obio 0x0 priority 4
```
[1st monochrome monitor on a Sun-2/50 or Sun-2/160.]

```
device    bwone0 at mb0 csr 0xc0000 priority 3
```
[1st monochrome Sun-1 monitor — see *bwone*(4s).]

```
device    vp0 at mb0 csr 0x400 priority 2
```
[Ikon Versatec Board — see *vp*(4).]

```
device    vpc0 at mb0 csr 0x480 priority 2
```
[1st Systech Centronics/Versatec Board — see *vpc*(4s).]

```
device    vpc1 at mb0 csr 0x500 priority 2
```
[2nd Systech Centronics/Versatec Board.]

```
device    pi0 at mb0 csr 0xee2000
```
[Parallel input. Only used on Sun Models 100U and 150U, for keyboard and mouse.]

```
device    tod0 at mb0 csr 0xee1000
```
[Time of day clock on the Sun-2/120 or Sun-2/170.]

```
device    tod0 at mb0 csr vme busmem 0x200800
```
[Time of day clock on the Sun-2/160 or Sun-2/50.]

2.7.2. Kernel Reconfiguration for Standalone Systems

For standalone machines, proceed as follows.

1. Change directory to */sys/conf*, and copy the *GENERIC* file to produce your own system configuration file. We'll call this latter file *SYS_NAME*:

```
gaia# cd /sys/conf
gaia# cp GENERIC SYS_NAME
gaia# chmod +w SYS_NAME
```

2. Create the *../SYS_NAME* directory (if you haven't already) to contain the kernel image. Remember: since the system build utility */etc/config* places its output files here, the directory **must** have the same name as your system configuration file:

```
gaia# mkdir ../SYS_NAME
```

3. Edit */sys/conf/SYS_NAME* to reflect your system configuration.

   As you look at the file, you'll notice several new lines and various changes from the 1.1 version of *GENERIC*. Use the annotated copy of *GENERIC* provided in the previous section for an explanation of these changes. Make sure you are including the proper device description lines for your system.

4. Still in the */sys/conf* directory, run */etc/config*. Then change directory to the new configuration directory, and make the new system (remember to substitute your actual system image name for *SYS_NAME*):

```
gaia# /etc/config SYS_NAME
gaia# cd ../SYS_NAME
gaia# make depend
[ lots of output ]
gaia# make
[ lots of output ]
```

5. Now you can save your old kernel, install your new one, and try everything out:

```
gaia# mv /vmunix /vmunix.old
gaia# cp vmunix /vmunix
gaia# /etc/halt
        The system goes through the halt sequence, then
    the monitor displays its prompt, at which point you
    can boot the system:
> b vmunix
        The system boots up multi-user, and then
    you can try things out.
gaia#
```

6. If the system appears to work, this completes installation. If the new kernel doesn't seem to be functioning properly, boot */vmunix.old*, copy it back to */vmunix*, and go about fixing your new kernel:

```
gaia# /etc/halt
> b vmunix.old -s
gaia# mv /vmunix /vmunix.oops
gaia# cp /vmunix.old /vmunix
gaia# ^D      [ Brings the system up multi-user ]
gaia#
```

2.7.3. Kernel Reconfiguration for Servers

For server machines, proceed as follows.

1. Change directory to */sys/conf*, and copy the *GENERIC* file to produce your own system configuration file. We'll call this latter file *SYS_NAME*:

```
gaia# cd /sys/conf
gaia# cp GENERIC SYS_NAME
gaia# chmod +w SYS_NAME
```

2. Create the *../SYS_NAME* directory (if you haven't already) to contain the kernel image. Remember: since the system build utility */etc/config* places its output files here, the directory **must** have the same name as your system configuration file:

```
gaia# mkdir ../SYS_NAME
```

3. Edit */sys/conf/SYS_NAME* to reflect your system configuration.

   As you look at the file, you'll notice several new lines and various changes from the 1.1 version of *GENERIC*. Use the annotated copy of *GENERIC* provided above for an explanation of these changes. Make sure you are including the proper device descripton lines for your system.

4. Still in the */sys/conf* directory, run */etc/config*. Then change directory to the new configuration directory, and make the new system (remember to substitute your actual system image name for *SYS_NAME*):

```
gaia# /etc/config SYS_NAME
gaia# cd ../SYS_NAME
gaia# make depend
[ lots of output ]
gaia# make
[ lots of output ]
```

5. If you have a specially configured client kernel, it can be reconfigured now as well:

```
gaia# cd /sys/conf
gaia# cp GENERIC CLIENT_KERNEL_NAME
gaia# chmod +w CLIENT_KERNEL_NAME
[ Edit CLIENT_KERNEL_NAME to reflect all clients' systems.
    Be especially careful with the device description lines, given above. ]
gaia# mkdir ../CLIENT_KERNEL_NAME
gaia# /etc/config CLIENT_KERNEL_NAME
gaia# cd ../CLIENT_KERNEL_NAME
gaia# make depend
[ lots of output ]
gaia# make
[ lots of output ]
```

6. Now you can position yourself in the directory which has the server's kernel in it, save your server's old kernel, install your new one, and try everything out:

```
gaia# cd ../SYS_NAME
gaia# mv /vmunix /vmunix.old
gaia# cp vmunix /vmunix
gaia# /etc/halt
        The system goes through the halt sequence, then
    the monitor displays its prompt, at which point you
    can boot the system:
> b vmunix
        The system boots up multi-user, and
    then you can try things out.
gaia#
```

7. Next, install the appropriate client kernel in */pub*.
   - If you reconfigured a special client kernel (in Step 5 above), copy it into */pub*:

     ```
     gaia# cd /sys/CLIENT_KERNEL_NAME   [or wherever your client kernel is]
     gaia# cp vmunix /pub/vmunix
     ```

   - Otherwise place a copy of your server's kernel (if appropriate) in */pub*:

     ```
     gaia# cp /vmunix /pub/vmunix
     ```

8. If everything appears to work, you can finish by rebooting each of your clients. See the final step in the standalone instructions above if you have problems with your kernel.

2.8. 'Uninstalling' the 1.4 Release

If you run into problems while running 1.4, you can back out the changes[1] by using the "uninstall" option of the installation utility. You then reconfigure your kernel, and can run as a 1.1 Sun system again. Proceed as follows.

PLEASE NOTE: If you are 'uninstalling' a network disk server, you **must** halt all diskless clients before proceeding.

1. Load the release tape, as described in the normal installation procedure above.
2. To run the 'uninstall' option of the utility, type the following command, using only **one** of each set of terms in braces. The first set of terms specifies your tape device; and the last designates your machine as a server, standalone with tape drive, or Workstation on a network using a another machine's (*server_name*'s) tape drive:

```
gaia% su
Password: Type the root password here
gaia# cd /usr/etc
gaia# 1.4_upgrade uninstall {ar|mt|st}
        {server|tapefull|tapeless server_name}
```

[1] NOTE: Optional software is not backed out during the uninstall.

This takes about 25 minutes.

3. Reconfigure your kernel as described in the section just above.

Chapter 3

Using the New *diag* to Format and Label Disks

The second file on the 1.4 Release tape contains a new version of ***diag***, the disk formatting/labelling program. This version of ***diag*** supports several new SCSI 85 MByte drives (the Micropolis 1325, the Fujitsu M2243AS, and the Vertex V185), provides improved disk diagnostics and bad block handling, and supports Rev. C of the Xylogics 450 Disk Controller PROM's.

If you have a new disk and you are installing a complete release, you must use this version of ***diag*** during the standard UNIX installation procedure for disk initialization (the phase titled ***Using the Diag Utility*** in the ***System Manager's Manual***). This means that you will be using your 1.1 Release tape and 1.1 ***System Manager's Manual*** to perform the first part of UNIX installation, then switch to the 1.4 Release tape and this chapter for disk formatting and labelling, and then return to the 1.1 tape and documentation to complete UNIX installation. Finally, when you have installed 1.1, you will switch back to the 1.4 tape to perform 1.4 installation, following the instructions in the earlier chapters of this document. Instructions follow.

1. Begin UNIX installation with your 1.1 Release tape, following the procedures in the ***System Manager's Manual*** chapter ***Installing UNIX for the First Time***. Load the tape and the bootstrap program. If you are using a 100U/150U Manual for Release 1.1, this means you should complete installation through section 4.3.3 (***Loading the Bootstrap Program***); if you are using a 120/170 Manual for Release 1.1, go through section 3.3.3.
2. When you have completed this section, you should see the bootstrap program's prompt:

   ```
   Boot:
   ```

   Now switch to your 1.4 Release tape (first cartridge for 1/4" distributions).
3. Boot ***diag*** from your 1.4 tape by typing the following command (replacing ***tape*** with the appropriate device abbreviation for your controller):

   ```
   Boot: tape(0,0,1)
   Size: some_number+some_number+some_number bytes    [ varies with release ]
   ```

3.1. Phase One: Specifying Hardware Configuration

When ***diag*** starts up, it displays a sign on message, and begins its first series of queries about your hardware configuration. Specifically, ***diag*** asks what sort of disk controller(s) and disk drive(s) you have. The answers to these questions 'configure' ***diag*** to work with this specific hardware.

1. The first thing *diag* wants to know is the type of disk controller to use:

```
Version sccs version_number and date
Disk Initialization and Diagnosis

When asked if you are sure, respond with 'y' or 'Y'

specify controller:
        0 - Interphase SMD-2180
        1 - Xylogics 440 (prom set 926)
        2 - Xylogics 450
        3 - Adaptec ACB 4000 - SCSI
which one?  type the number for your controller type
```

2. *diag*'s next question is what address this controller occupies on the main system bus. Unless you have an unusual controller configuration[2], you can take the address from this table:

Table 3-1: Default Addresses for Disk Controllers

Controller Type	*Address (hex)*	
	1st Controller	2nd Controller
Interphase SMD-2180	40	48
Xylogics 450/440	ee40	ee48
Adaptec ACB 4000-SCSI for Sun-2/120 or 170	80000	84000
Adaptec ACB 4000-SCSI for Sun-2/160	ee2800	

When you give *diag* your controller's address, it echoes the address back to you:

```
Specify controller address on the mainbus (in hex): address

Device address: address you entered
```

3. If your controller interfaces to the SCSI bus (Adaptec, for example), *diag* asks for the address of the controller on the SCSI bus as well. The correct address is **0** for the first (or only) SCSI disk controller; **1** is the target number for the second:

```
Which target? SCSI bus address
```

4. Next, *diag* wants to know the unit number of the disk on this controller which you want to label and format. The correct unit number is **0** for the first (or only) drive on this controller; **1** is the unit number for the second:

---

[2] If you have one Xylogics SMD Controller and one Interphase SMD Controller in your system, you cannot use the default addresses (the Interphase Controller sees only four bytes). The Interphase must be configured to be at address 48, and the Xylogics at ee40. The Xylogics does not need to be the first controller specified. If both controllers are the same type, use the defaults. See the *Hardware Configuration and Expansion* chapter in the *System Manager's Manual for the 100U/150U* for Interphase Board configuration; board configuration procedures for other controllers are in the *Hardware Installation Manual* for the appropriate machine model.

```
Which unit? unit number for the drive you're working with
```

5. Now *diag* wants to know the type of disk drive you are working with. *Diag* displays a menu of the different disks it knows about, and asks you to specify your disk type. There are two menus, one for SMD disk drives, such as the Fujitsu Eagle, and one for SCSI drives like the Micropolis; the menu corresponding to your controller-type comes up. Let's assume you're formatting a SCSI disk:

```
Specify drive:
0 - Micropolis 1304
1 - Micropolis 1325
2 - Maxtor XT-1050
3 - Fujitsu-M2243AS
4 - Vertex V185
5 - Other

which one? type the number for your drive type

ncyl number acyl number nhead number nsect number interleave number
status:
[ ...status information... ]
```

When you select the disk drive you wish to operate on from the menu, *diag* displays a table of physical data about that disk, which includes the number of cylinders, number of alternate cylinders, number of heads, and number of sectors per track, and then displays drive-specific status information.

At this point, *diag* knows all it needs to know about the controller and the disk you are using, and displays its prompt:

```
diag>
```

You can now begin the second phase of the *diag* procedures, formatting and labelling the disk!

3.2. Phase Two: Formatting and Labelling the Disk

Next, you use *diag*'s disk formatting function to prepare and format new disk(s). After formatting, the disk must be labelled. The **label** subcommand is used to write a default partition map label to the disk.

There are two distinct disk formatting and labelling paths: one for disks controlled by SCSI disk controllers (Adaptec, for example), and one for disks controlled by SMD controllers (Xylogics, for example). Follow the procedures which are appropriate for your system configuration.

3.2.1. Formatting SCSI Disks

1. Begin by typing the **format** command. This calls up the SCSI formatting subprogram to *diag*, and you'll see its prompt:

```
diag> format
SCSI format.
format>
```

The SCSI format subprogram has various utilities which allow you to prepare and format a new disk. If you'd like to see a list of its capabilities, ask for help by typing **?**:

```
format> ?

SCSI Format Subcommands:
   f: format disk
   r: read defect list from disk
   p: print defect list from disk
   a: add defect to list
   d: delete defect from list
   s: surface analysis
   t: translate block no. to cyl/hd/bfi
   q: quit format
```

2. Your first task is to type in the disk defect list supplied with your disk drive.

   The location of this list depends on the type of workstation you have. Usually, the list is taped to the front or top of your pedestal. If you don't see it, or have misplaced it during unpacking, you should be able to find a second copy of the list taped to the disk drive housing inside the pedestal (remove the two Phillips screws from the top rear of the enclosure, slide the top of the beige metal housing off, and check).

   To enter the defect list, type **a** (for '**a**dd defect to list') to the SCSI format prompt, and then type the appropriate data for each subsequent prompt, taking this data from your defect listing:

```
format> a
cylinder?       number
head?   number
bytes from index?       number
```

   If you are dealing with a Micropolis drive, the defect map that comes with the disk groups defects by head; cylinder and bytes from index numbers appear in the CYL and BI columns. If you are formatting a Maxtor drive, the numbers appear in the CYL, H, and BYTE columns respectively.

3. Add an entry for each defect listed. When you're through, respond **p** (for '**p**rint defect list') to the format prompt. This displays the information you have entered. **Make sure this listing matches the defect listing which came with your drive.**

4. If you need to make corrections to the data you have entered, use the 'add defect' (type **a**) and 'delete defect' (type **d**) sub-commands.

5. When you have verified the defect listing, go on to format the disk with the format (**f**) sub-command. After you type the sub-command, the system warns you that formatting a disk destroys all information which might already be stored on that disk, and asks for confirmation before going ahead and doing the job:

```
format> format
format/verify, DESTROYS ALL DISK DATA!
are you sure? y
```

   The formatting process takes about three minutes. At the end of this process, you should get a "Defect list written on disk" message. If you get any other message ("SCSI reset", for example), the formatting process did not succeed, and the defect list has not been recorded on the disk. **You must format the disk again.**

6. When you have successfully formatted the disk, do a surface analysis of it using the surface analysis (**s**) sub-command. This analyzes the entire disk and adds any defects found to the disk's defect list. For a new disk, three surface analysis passes should be done:

```
format> s
Number of surface analysis passes (3 is usual)? 3
```

Three passes take between a half-hour and an hour to complete. When everything's done, you'll get a message to that effect.

7. If the surface analysis turns up bad sectors, the system will tell you how many bad sectors were found, and tell you to re-format the disk:

```
Surface analysis complete
some_number bad sectors found
Use the 'f' command to format the disk.
format>
```

Before continuing, you **must** reformat a disk with bad sectors.

8. When no bad sectors have been found by the surface analysis, you have successfully formatted the disk. Now you may go on to label the disk. This process is described below.

3.2.2. Labelling SCSI Disks

A disk must be labelled after it has been formatted. The disk label records information about how the disk is divided into partitions for such things as paging space and file systems.

1. To label your disk, type the **label** command in response to *diag*'s prompt. When you give the command to *diag*, it asks if you want to use the logical partition map that is 'built in' to the program, and then asks for confirmation before proceeding. Default partitioning for Sun-supplied SCSI disks is outlined in the following table[3]:

Table 3-2: Default Partition Sizes for SCSI Disk Subsystems

SCSI Disk	*Raw*	*Partition Sizes (MBytes)*							
		"a"	"b"	"c"	"d"	"e"	"f"	"g"	"h"
Micropolis 1304	50	8.1	8.4	43.1	***unused***	***unused***	***unused***	26.5	***unused***
Micropolis 1325	85	8.1	17.1	71.2	***unused***	***unused***	***unused***	45.9	***unused***
Maxtor XT-1050	50	8.1	8.4	44.4	***unused***	***unused***	***unused***	27.9	***unused***
Fujitsu M2243AS	86	8.1	17.1	72.0	***unused***	***unused***	***unused***	46.7	***unused***
Vertex V185	85	8.1	17.1	70.9	***unused***	***unused***	***unused***	45.5	***unused***

If you confirm, *diag* will partition your disk according to these default maps[4]:

[3] Note that in all discussions of disk partitioning, numbers are approximate, since formatted capacity depends on the type of controller being used with the drive. Also, note that a 'Megabyte', as far as numbers given in discussions of disk capacity, is defined as one million bytes.

[4] If these default maps are inadequate for your system, you can use *diag*'s **partition** command at this point to design your own labels. See *diag*(8S) for information.

```
diag> label
label this disk...
OK to use logical partition map 'your disk type'? y
Are you sure you want to write? y
```

2. After labelling the disk, ***diag*** automatically verifies the label it has just written. As an example, the verify for a Fujitsu M2322 might look like this:

```
[ This is an example only; do not enter this information. ]

verify label
id: <Fujitsu-M2322 cyl 821 alt 2 hd 10 sec 32 interleave 1>
        Partition a: starting cyl=0, # blocks=15884 [ #'s vary with disk ]
        Partition b: starting cyl=50, # blocks=33440
        Partition c: starting cyl=0, # blocks=262720
        Partition g: starting cyl=155, # blocks=213120
diag>
```

3. This completes the formatting and labelling process for a single SCSI disk. If you have a second disk drive on your controller, or two controllers and two or more drives, you may now get back to the beginning of ***diag***'s first phase by responding to the ***diag*** prompt with the command **diag**:

```
diag> diag
```

Note that you must complete both phases of ***diag*** for each of your disks. Be careful each time in the first phase of ***diag*** to respond with correct values when you are prompted for: controller mainbus address, controller type, disk type, and disk unit number.

4. If you have only one disk, or if you are done formatting and labelling all of your disks, you are ready to continue with the next phase of installation. Get back to the bootstrap program by typing the **q** (**q**uit) command to ***diag***, and you'll see the boot program's prompt again:

```
diag> q

Boot:
```

5. Now switch back to your 1.1 tape, and continue with installation using the procedures in your 1.1 manual. If you are using a 100U/150U Manual for Release 1.1, you are ready to start section 4.3.5, ***Loading the Mini UNIX System***; if you are using a 120/170 Manual for Release 1.1, begin with section 3.3.5.

When you have completed installation for the 1.1 Release, follow the procedures in Chapters 1 and 2 of this document for installing the incremental 1.4 Release.

3.2.3. Formatting SMD Disks

1. Begin by typing the **format** command. ***Diag*** warns you that formatting a disk destroys all information which might already be stored on that disk, and asks for confirmation before going ahead and doing the job:

```
diag> format
format/verify, DESTROYS ALL DISK DATA!
are you sure? y
```

2. Now, *diag* asks for the number of surface analysis passes to do on the disk. The surface analysis phase of the formatting is for detecting bad spots on the disk and mapping them to alternate places. When formatting a disk for the first time, five surface analysis passes is a reasonable number. You can use just one surface analysis pass if you are reformatting a disk that has been formatted before and is known not to have any bad spots:

   ```
   # of surface analysis passes (5 recommended)? 5
   ```

   The complete format phase (5 passes) takes about two hours for a Fujitsu M2322, and about five hours for an Eagle. It is well worth taking the time to do this when formatting a new disk.

After surface analysis, *diag* formats the disk, and displays the current cylinder number as it formats each cylinder.

At the end of the format process, *diag* displays a message telling you that it has finished; then it tells you to use the label command to label the disk:

```
cyl 588 format complete - 0 bad sector(s)
Use the label command to label the disk
diag>
```

Labelling the disk is the next step.

3.2.4. Labelling SMD Disks

A disk must be labelled after it has been formatted. The disk label records information about how the disk is divided into partitions for such things as paging space and file systems.

To label your disk, you use the **label** subcommand. When you give the command to *diag*, it asks if you want to use the logical partition map that is 'built in' to the program, and then asks for confirmation before proceeding[5]. Default partitioning for Sun-supplied SMD disks is outlined in the following table[6]:

---

[5] If these default maps are inadequate for your system, you can use *diag*'s **partition** command at this point to design your own labels. See *diag*(8S) for information.

[6] Note that in all discussions of disk partitioning, numbers are approximate, since formatted capacity depends on the type of controller being used with the drive. Also, note that a 'Megabyte', as far as numbers given in discussions of disk capacity, is defined as one million bytes.

Table 3-3: Default Partition Sizes for SMD Disk Subsystems

SMD Disk	*Raw*	*Partition Sizes (MBytes)*							
		"a"	"b"	"c"	"d"	"e"	"f"	"g"	"h"
Fujitsu 2312K (8")	84	8.1	17.1	67.3	***unused***	***unused***	***unused***	42.0	***unused***
Fujitsu 2284 (14")	169	8.1	17.1	134.5	***unused***	***unused***	***unused***	109.1	***unused***
Fujitsu 2322 (8")	168	8.1	17.1	134.5	***unused***	***unused***	***unused***	109.1	***unused***
Fujitsu 2351 Eagle	474	8.1	17.1	395.7	***unused***	***unused***	***unused***	369.8	***unused***

1. Type the **label** subcommand in response to *diag*'s prompt:

```
diag> label
label this disk...
OK to use logical partition map 'your disk type'? y
Are you sure you want to write? y
```

2. After labelling the disk, *diag* automatically verifies the label it has just written. As an example, the verify for a Fujitsu M2322 might look like this:

```
[ This is an example only; do not enter this information. ]

verify label
id: <Fujitsu-M2322 cyl 821 alt 2 hd 10 sec 32 interleave 1>
        Partition a: starting cyl=0, # blocks=15884 [ #'s vary with disk ]
        Partition b: starting cyl=50, # blocks=33440
        Partition c: starting cyl=0, # blocks=262720
        Partition g: starting cyl=155, # blocks=213120
diag>
```

3. This completes the formatting and labelling process for a single disk. If you have a second disk drive on your controller, or two controllers and two or more drives, you may now get back to the beginning of *diag*'s first phase by responding to the *diag* prompt with the command **diag**:

```
diag> diag
```

   Note that you must complete both phases of *diag* for each of your disks. Be careful each time in the first phase of *diag* to respond with correct values when you are prompted for: controller mainbus address, controller type, disk type, and disk unit number.

4. If you have only one disk, or if you are done formatting and labelling all of your disks, you are ready to continue with the next phase of installation. Get back to the bootstrap program by typing the **q** (quit) command to *diag*, and the bootstrap displays its prompt sign again:

```
diag> q

Boot:
```

5. Now switch back to your 1.1 tape and continue installation from your 1.1 manual. If you are using a 100U/150U Manual for Release 1.1, you are ready to start section 4.3.5, ***Loading the Mini UNIX System***; if you are using a 120/170 Manual for Release 1.1, begin with

section 3.3.5.

When you have completed installation for the 1.1 Release, follow the procedures in Chapters 1 and 2 of this document for installing the incremental 1.4 Release.

Chapter 4

Changes from the 1.1 Release Software

This chapter briefly describes the contents of the 1.2 Release Software, and details changes that have been made since the 1.1 Release. User programs may need to be re-linked or re-compiled to take advantage of these changes.

4.1. Software Contents and Details of Changes

4.1.1. Window System

- Pw_region has been rewritten to handle retained pixwins. Also, a problem with locking the wrong section of the screen during pixwin operations using a region has been corrected.
- Pw_stencil has been corrected to reset some global state that previously left a time bomb in the code that could be tripped over later by a pw_rop or pw_replrop call.
- Pw_get has been corrected to return the proper value when called using a pixwin that is not retained.
- The optsw_setvalue call for enumerated and boolean items (optsw_enum.c and optsw_bool.c) now correctly maintains the correspondence between internal and display data.
- */etc/utmp* is now reset appropriately when Exit is invoked in the Root Manager menu.
- ***lockscreen*** can now finish the Show Desktop command when ***lockscreen*** had been invoked by the super-user, rather than locking the machine.
- Win_screendestroy has been corrected to fix a problem which caused users to be logged off when exiting ***suntools***.

4.1.2. Assembler

- The 50 character name limit has been removed; the new limit is 512 characters.

4.1.3. C Compiler

- The ***atof*** bug in the compiler and C library, which caused erroneous answers for very large or very small numbers, has been patched. A script is provided with the release tape to patch the C Library; the script is run as part of normal interim release installation.
- Code put out by the compiler to do loops like

```
for( i=0; i<10; i++)
```

  was marked with the incorrect line number (for dbx). This is repaired. The problem with marking the switch-statement selection code with the line number of the "switch(<exp>)" has also been fixed.
- Unsigned constant folding now works (better). This fixes the longstanding:

```
#define MAXINT  (int)((unsigned)-1)<<1
```

- We now try a little harder to recover from certain syntax errors. This avoids the most common crash-&-burn mode error.
- The compiler now uses the ".skip" assembler directive, rather than many ".long 0" directives. This speeds up compilation of lines like:

```
static int x[100000] = { 1, 2, 3 };
```

- A bug in accessing bit fields has been fixed.
- Several changes have been made to avoid the 'running-out-of-register' problem often seen in FORTRAN compilations when compiling complicated expressions with all registers busy.
- The bug with `unsigned char`'s and `unsigned short`'s being cast to `unsigned int` in cases like:

```
unsigned char x ( int a, b ){
        foo( (unsigned short)( a-b) ); /* 1 */
        return( (unsigned char)( a+b) ); /* 2 */
}
```

  where the implicit conversion in parameter passing and value returning was done incorrectly has been fixed.
- The problem with floating-point relations in which one or both sides have complicated addresses (like subscripting) has been fixed.
- A fragment like:

```
{ register float *fp; foo(*fp++); }
```

  could previously not be compiled, as the float-double conversion code could not recognize this addressing mode. This has been fixed.
- The 'test' in the fragment:

```
{ double d; if (d)....
```

  previously did the wrong thing for positive denormalized numbers with no significant bits in the first word. This has been fixed.
- The bug which caused 'register float' variables to generate bad code has been repaired.

- A bug which caused integer and floating point comparisons to be done in the wrong mode has been fixed. For example, the following:

```
int a = 1;
double f = 1.1;
if (a < f) {
        printf("less\n");
} else {
        printf("more\n");
}
```

previously printed "more" instead of "less".

4.1.4. FORTRAN Compiler

- Single precision reals in PARAMETER statements are now actually set to the first word of a double precision version of the value. This fixes the problem with real parameters containing an erroneous value.
- Previously, if a program with 'do' loops nested more than 6 deep was compiled without the **-O** flag, the compilation would start using Address Registers as loop indices, causing the resulting code to loop infinitely. This has been fixed.
- A bug which caused '`f77 -o prog.f`' to load a null file into ***prog.f*** has been fixed.
- Changes have been made to the FORTRAN library to make use of new intrinsics in the revised Sky Microcode.
- A call on an external is now recognized as defining its arguments in code motion.
- In evaluating '`x = f(x) **2`' with **-O** set, `f` is no longer called twice.

4.1.5. Diag

- A revised version of ***diag*** is provided with this release. This new version supports Revision C Xylogics 450 PROMs and also has improved diagnostics. See Chapter 3 of this document for details and installation instructions.

4.1.6. Sky Driver

- A new Sky device driver that fixes problems with Sky interrupt handling is provided with this release.

4.1.7. SCSI Drivers

- New SCSI disk and tape drivers, and also a new SCSI boot block, are provided with this release. This fixes problems which occurred when a SCSI board was in a system that also had a 1/2" tape drive.

4.1.8. UART Driver (zs)

- A problem with dropping DTR during booting — which caused console terminals with DTR connected to hang after UNIX booted — has been fixed.
- Previously, the last character going out tended to get dropped or corrupted when changing terminal modes. This has been fixed.
- The "PF key" problem — back-to-back characters being garbled due to the incorrect mode in the chip — has been repaired.
- The driver has been changed so that the hardware now ignores the state of CD, and both hardware and software now ignore the state of CTS. This makes dial-in and dial-out on the same line really work.
- The driver has been fixed so that it now responds to '^S' faster under heavy load.
- Hardware flow control, an 'accidental' feature, is now disabled.

4.1.9. Sky Microcode

- A new version of the Sky microcode that fixes several problems with the previous version is provided in this release.
- A new ***skyversion***(8) command is included in this release. ***skyversion*** reports the Sky version number of the microcode.

4.1.10. Vpltdmp

- Has been fixed to compute the number of bytes in a plot correctly.

4.2. Documentation Changes

4.2.1. Diag

- Supplemental ***diag*** documentation for use with the revised version of ***diag*** on the release tape is provided with in this document. Chapter 3 gives instructions for users with new disks, who must use this version to initialize their disks.

4.2.2. Sendmail Installation

- Users must now install the Mail system before coming up multi-user during UNIX installation, rather waiting until UNIX installation is complete. Instructions are given in the errata to the ***System Manager's Manual***; see Chapter 7 of this document.

4.2.3. zs(4)

- Now includes information on remote dial-in/dial-out. See the *zs*(4) page in Chapter 8 of this document.

4.2.4. /etc/skyinit

- If you include a Sky Board in your Sun system, and you reboot before doing a 'MAKEDEV sky', you must **either** reboot again **or** run the */etc/skyinit* program after doing the 'MAKEDEV sky' to load in the Sky Microcode. Documentation is included in the errata to the *System Manager's Manual*; see Chapter 7 of this document.

4.2.5. Kernel Configuration

- The pseudo-device **ether** must be included in the kernel configuration file. See the errata to the *System Manager's Manual*, Chapter 7 of this document.
- If the kernel configuration file contains **sc** it must also contain the corresponding **st** AND **sd** entries, whether or not the system contains both a SCSI disk and a SCSI tape. See the errata to the *System Manager's Manual*, Chapter 7 of this document.
- If you edit */sys/h/param.h* you need to *touch /sys/KERNEL/param.c*. See the errata to the *System Manager's Manual*, Chapter 7 of this document.

4.2.6. Miscellaneous Errata in the System Manager's Manual

- Various errors in the *System Manager's Manual* have been fixed, such as some of the command-line syntax for remote installation, and the minimum size of */pub*. See Chapter 7 of this document.

4.2.7. Miscellaneous Manual Pages

- See Chapter 8 of this document: *as*(1), *cc*(1), *cpp*(1), *screendump*(1), *screenload*(1), *malloc*(3), *zs*(4S), *acct*(5), *utmp*(5), *skyversion*(8), and *dkinfo*(8). These pages either describe new facilities, have been revised for this release, or were mistakenly omitted from the 1.1 manuals.

Chapter 5

Changes from the 1.2 Release Software

The following indicate changes made since the 1.2 Release to provide support for the Sun-2/50. User programs may need to be re-linked or re-compiled to take advantage of these changes.

5.1. Software Contents and Details of Changes

5.1.1. Model 50 Kernel Support

- Numerous changes have been made to the UNIX kernel to add support for the Sun-2/50.

5.1.2. PROMs for the Sun-2/50

- A new PROM set providing Sun-2/50 support is available.

5.2. Documentation Changes

5.2.1. Sun-2/50 Hardware Manual

- A version of the ***Hardware Installation Manual for the Sun-2/50 Desktop SunStation*** (Part Number: 800-1143-01) is provided with this release. Please use this manual when setting up any Sun-2/50's you receive with this release, and send us your comments!

Chapter 6

Changes from the 1.3 Release Software

The following indicate changes made since the 1.3 Release. Primarily, these changes were made to provide support for the Sun-2/160. User programs may need to be re-linked or re-compiled to take advantage of these changes.

6.1. Software Contents and Details of Changes

6.1.1. Model 160 Kernel Support

Numerous changes have been made to the UNIX kernel to add support for the Sun-2/160.

6.1.2. New Version of diag

diag now supports various 85 MByte SCSI disks (the Micropolis 1325, the Fujitsu M2243AS, and the Vertex V185). See Chapter 3 of this manual for instructions on using ***diag*** to initialize new disks. The ***diag***(8S) page is also included in Chapter 8, and on the distribution tape.

6.1.3. New Version of tip

The new version of ***tip*** provided with 1.4 fixes many bugs related to tandem mode flow control; ***tip*** and ***uucp*** also now support the Hayes SmartModem 1200 (see below). Other changes are:

- The ***.tiprc*** and phones files now allow comments (#).
- The force and raise characters were previously set to ^P and ^A; they are now not set by default.
- Default parity is now 'none'.
- Halfduplex is another name for localecho.

A new ***tip***(1C) manual page is included in Chapter 8, and on the distribution tape.

6.1.4. Hayes Support for tip and uucp

Tip and ***uucp*** now support the Hayes SmartModem 1200. Many modems are compatible with the Hayes, such as the Ventel EC1200-31 and EC1200-32 (aka 1200PLUS). Such modems often claim to be "AT" compatible or use the "AT" command set.

Switch Settings

The proper switch settings for the Hayes SmartModem 1200 for use with ***tip*** and ***uucp*** are listed below. For other Hayes compatible modems the switches should be set similarly — see your modem reference manual.

Switch	*Setting*	*Description*
1	UP	DO NOT force DTR true
2	DOWN	respond with digit result codes, NOT English words
3	DOWN	result codes WILL be sent
4	DOWN	DO NOT echo characters in command state
5	UP	DO answer incoming calls
6	UP	DO NOT force Carrier Detect true
7	UP	for connection to RJ11 modular jack
8	DOWN	enable command recognition

Tip Support

To use a Hayes modem with ***tip***, the modem type ("at" attribute in */etc/remote* file) should be specified as "hayes" or "at". The phone number ("pn" attribute) can contain any valid dial commands, see your modem manual for details. The most common dial commands are:

0-9 dial that number

, pause for 2 seconds to wait for secondary dial tone

P switch to pulse dialing

T switch to tone dialing

By default ***tip*** uses tone dialing. Start the phone number with "P" to use pulse dialing.

To allow parameters of the dialer to be set, start the phone number with an 'S' to start a "Set" command. For example, to change the dial tone wait time, specify the phone number as:

```
:pn=S6=10DT4085551212:
```

Note that the Dial command must be specified explicitly.

NOTE: ***Tip*** can cycle through a set of phone numbers, trying each one until a connection is made. Previously it was common to separate the phone numbers with a comma, although this feature was never documented. Now, since comma is a valid dial character, phone numbers must be separated with a '|'. For example:

```
:pn=4085551212|4085551213|4085551214:
```

This is a potential compatibility problem and even affects people who are not using Hayes modems. They may have to change their */etc/remote* file.

Uucp Support

To use a Hayes (or AT) compatible modem with ***uucp*** the modem type should be specified as ACUHAYES (or ACUAT). As with ***tip***, the phone number can contain any valid dial commands and ***uucp*** defaults to tone dialing. However, ***uucp*** uses any alphabetic prefix of a phone number to look up a translation in the *L-devices* file. Therefore, to start a phone number with a letter insert a '–' before the letter. For example, to switch to pulse dialing, specify the phone number as

```
-P4085551212
```

An *L.sys* line that uses a Hayes modem might look like:

```
sun Any ACUHAYES 1200 -P9,4085551212 login:-EOT-login: uucp ssword:
whatever
```

To use the default of tone dialing simply omit the "–P".

As with ***tip***, ***uucp*** also allows `Set` commands in the phone number. Start the phone number with "–S" and don't forget to explicitly specify the "D" dial command.

6.1.5. Tape Retensioning

Quarter-inch tapes controlled by Archive (ar) or SCSI (st) controllers now may be retensioned. See the *mt*(1) page included in Chapter 8 for details.

6.1.6. MAKEDEV Bug Fix

MAKEDEV is now more rigorous about checking its arguments.

6.1.7. Sky Board Error Messages

Several customers have requested more information on the Sky Board error messages.

The Sky Floating Point Board does not use interrupts. Therefore, if the status register of the board indicates that interrupts are enabled or indicated, the board is in an error condition.

The Sky board status register looks something like this

```
[] [] [] [] []  |     []      |     []      |    []
                |             |             |
   Other        | Interrupts  | Programmed  | Illegal Transfer
 Functions      |  Enabled    | Interrupt   |    Interrupt
                |             |             |
```

Since interrupts are not used on the board, the bottom three bits of the status register, the ones dealing with interrupts, should always be zero. Any deviation from this state causes the error messages below.

```
skyintr: sky board unrecognized status, status = 0x%x
```

This message indicates that one of the two interrupt bits in the status register is set and interrupt enable is not. This is caused by a Sky Board initialization problem due to a design flaw. The system is fine, but you'll probably continue to see the message.

The "status = 0x%x" part of the message displays the value of the status register with four hexidecimal digits preceeded by a 0x to indicate that the digits are in hex. This is to help in evaluating the error condition.

```
skyintr: sky board interrupt enabled, status = 0x%x
```

This message means that interrupt enabled bit in the status register is set, as it should not be. The software attempts to clear this bit after indicating the error. If this message continues to appear, your system is probably hung.

6.1.8. Changes to the SunCore Graphics Package

This section is a summary of changes to the **SunCore** graphics package for the 1.4 Release.

6.1.8.1. SunCore — Added `set_pick` *Function*

The size of a square pick aperture can be specified so that the application program can set the sensitivity of the PICK device.

6.1.8.2. SunCore — Additional Raster Fonts

There are now six raster (STRING precision) fonts available for **SunCore**.

6.1.8.3. SunCore — Sun/2-160 Support

SunCore can now run on */dev/cgtwo* (Sun-2 color board) as well as all previously supported display surfaces. A new view surface, *cg2dd*, has been added for the Sun-2/160 color board as a raw device.

6.1.8.4. SunCore — Speed Improvements

Picking has been speeded up between 20% (for a display file of a few untransformed segments of very few primitives) and 80% (for a display file of many fully transformed segments of many primitives).

Transformations have been speeded up by 10%-20%.

Other various improvements have been made in **SunCore** and the underlying libraries and compilers, so a general (5%-10%) improvement in performance should be seen in **SunCore**.

6.1.8.5. SunCore — Bug Fixes

- Calling the `text()` function with a space character as part of the text string, ***character_precision*** set to STRING, and ***font*** set to SPECIAL, previously generated a segmentation fault — this problem has been fixed.
- Calling the `set_font()` function with ***character_precision*** set to STRING, would previously use the default font the first time the function was called instead of using the requested font — this problem has been fixed.
- The actual width of fat vectors (line with ***line_width*** >0) are now the same independent of the displayed slope of the line.
- Markers are now centered at the current position.
- `set_zbuffer_cut` now reports an error if the surface does not support hidden surfaces.
- All error messages are now sent to the standard error file.
- Calling the `terminate_core()` function while there were still many retained segments used to take a long time — this problem has been fixed.
- Calling the `set_ndc_2()` function on a raw ***bw2*** surface no longer produces a segmentation fault when the ***x*** and ***y*** axes are not full scale. This problem also manifested itself by producing strange results from `size_raster()`.
- Every line segment created by `polyline()` can now be picked.
- `text()` no longer produces a floating-point exception when the projection is perspective.
- The machine no longer hangs after a call to `polygon_abss_3()`.
- Single pixel-high polygons no longer generate a segmentation fault.
- Horizontal edges of a polygon now create the same scan line segments independent of the directional sense of the polygon.
- The SKY version of the **SunCore** library now has a `get_view_surface()` function.
- The Pascal and FORTRAN wrappers for `get_mouse_state()` now have the correct number of arguments.
- The problem of dragged rasters becoming invisible has been fixed.
- `set_pickid()` now sets the pickid for all subsequently created primitives in a segment, not just for the next primitive.

6.1.9. Changes to SunWindows

A new pixrect driver using `cg2_` prefixes is available for the Sun-2 color board (***/dev/cgtwo0***). A variety of bugs have been fixed in the pixrect code.

6.2. Documentation Changes

6.2.1. Sun-2/160 Hardware Installation Manual

A version of the ***Hardware Installation Manual for the Sun-2/160 Desktop SunStation*** (Part Number: 800-1144-01) is provided with this release. Please use this manual when setting up any Sun-2/160's you receive with this release, and send us your comments!

6.2.2. Miscellaneous Manual Pages

See Chapter 8 of this document. ***bessel***(3F), ***bit***(3F), ***time***(3F), ***rand***(3F), ***etime***(3F), ***fdate***(3F), ***stat***(3F), and ***long***(3F) are included here, as they were omitted from the FORTRAN Library Functions Section of the 1.1 ***FORTRAN and Pascal*** Manual. ***mem***(4S) is also included; it has been revised to reflect VME bus support. Other pages include ***clear***(1), ***diag***(8S), ***mt***(1), ***tip***(1C), ***cgtwo***(4S), ***ie***(4S), and ***ftpusers***(5).

Chapter 7

Errata Pages for 1.1 Manuals

The following pages list errata from the 1.1 ***System Manager's Manual for the Sun Workstation — Models 100U/150U*** (Part Number: 800-1109-01) and the ***System Manager's Manual for the Sun Workstation — Models 120/170*** (Part Number: 800-1110-01). Note that there is one set for each manual.

Errata in the 1.1 Release of the *System Manager's Manual for the Sun Workstation — Models 120/170*

Page(s)	Comments
na	Kernel Configuration. In Section 3.3.12, the documentation says that the **pseudo-device ether** line is not needed in the configuration file for Workstations without Ethernet interfaces. Due to a bug in the current release, however, this line is currently mandatory for all systems, whether or not they have an Ethernet Board. If the line is left out, your subsequent *make* will fail with "`undefined _arpioctl error code 1`" and the resulting kernel won't boot.
na	Kernel Configuration. In Section 3.3.12, there is an undocumented restriction when configuring a kernel for systems with SCSI disk and/or SCSI tape. Along with the **controller sc0** line, the the kernel configuration file must include BOTH the **disk sd0** AND **tape st0** lines, whether or not the SCSI disk and SCSI tape are actually present in the system.
na	Kernel Configuration. If you edit the */sys/h/param.h* file to tune your kernel configuration, you must *touch*(1) *sys/KERNEL/param.c* immediately afterwards for the changes to come into effect.
na	*vfont* files. The *vfont* files were included in the 1.1 Release. They are in the same *tar* file as the demos, manuals, and games. To load the files, see Section 4.14.
na	Sky Board. If you include a Sky Board in your Sun system, and you reboot before running the command 'MAKEDEV **sky**', you must **either** reboot again **or** run the */etc/skyinit* program after doing the 'MAKEDEV **sky**' to load in the Sky Microcode. Proceed as follows: `# cd /dev` `# MAKEDEV sky` `# cd /etc` `# skyinit` *[message to the effect that x # words of microcode loaded]*
3-16, 3-21, 3-24, 3-25, 3-27, 3-30	In Section 3.3.10, *Using Setup to Configure Your System*, the minimum and default sizes of the */pub* partition as it is allocated by the *setup* program during first time UNIX installation was misquoted: the documentation says minimum */pub* is 17 MBytes and default is 20 MBytes; minimum is in fact 20 MBytes, and default is in fact 24 MBytes.
3-32	Immediately before *Booting the Full UNIX System* (Section 3.3.11), you must install the Mail System as described in Chapter 5, *System Set-up and Operation*. Complete AT LEAST Sections 5.2, 5.2.1, 5.2.2, and 5.2.2.1 of Mail set-up. If you do not install */usr/lib/sendmail.cf* before coming up multi-user, *sendmail* will try to run without the necessary files, and will leave one *qf* . . . and one *af* . . . file in the root directory.

Page(s)	Comments
5-10	Section 5.2.2.2, ***Telling Sendmail your Domain Name***, includes a procedure for using the "CV" line in ***sendmail.cf*** for local mail routing. This feature does not currently work (bug).
6-2, 6-3	Section 6.1 (***Step 1: What to Save***) of the ***Upgrading System Software*** Chapter gives incorrect command syntax for ***tar*** file extraction from machines without local tape drives. Text for numbered step 1 reads: **# cd /** **# tar cfb –** *block_size* **dev/r***tape#* **.??* dev/MAKEDEV.local** **etc lib usr/include usr/lib | rsh** *remote_host* **dd of=/dev/***tape#* **obs=***block_size***b** It SHOULD read: **# cd /** **# tar cfb –** *block_size* **.??* dev/MAKEDEV.local** **etc lib usr/include usr/lib | rsh** *remote_host* **dd of=/dev/***tape#* **obs=***block_size***b** Text for numbered step 2 reads: **# tar cfb –** *block_size* **dev/r***tape#* **usr/{spool,local,** *usera,userb,userc,userd...}* **|** **rsh** *remote_host* **dd of=/dev/***tape#* **obs=***block_size***b** It SHOULD read: **# tar cfb –** *block_size* **usr/{spool,local,** *usera, userb,userc, userd...}* **|** **rsh** *remote_host* **dd of=/dev/***tape#* **obs=***block_size***b** In both cases, the "dev/r*tape#*" before the pipeline is unnecessary.
3-7, 3-8, 3-12, 3-33, 4-5	A new version of ***diag*** with enhanced diagnostic and bad-block-handling capabilities is being shipped with the 1.3 distribution software. If you are installing a system with a new disk, use the instructions in Chapter 3 of this document with your 1.1 manual during installation; they will take care of the changes to noted pages.
4-4	There are two syntax errors in the section 4.3, ***Setting up the Remote Host***. The lines given for ***nd.local*** are: `user 0 0 /dev/`*disk*`0g -1 -1 -1` `son` They SHOULD be: `user 0 0 /dev/`*disk*`0g 0 -1 -1` `son` Secondly, the MAKEDEV command reads: **# MAKEDEV nd** It SHOULD read: **# MAKEDEV nd10**

Page(s)	Comments
5-16	There are three major items relating to UUCP. First, on page 5-16, the syntax for step 6 of UUCP installation is incorrect. Text for step 6 SHOULD read: Create the appropriate device for your modem with the following series of commands: **# cd /dev** **# mknod cua0 c 12 128** **# chmod 600 cua0** **# chown uucp cua0** **# mv ttya ttyd0** The third line of the original series of commands has been deleted. Note that this command series supersedes the series printed in the ***Technical Support Bulletin*** Issue 1984-4 of 23 July 1984 (item 4.2), in which the final line designated a **ln** command rather than a **mv**. Secondly, ***uuxt*** may fail because it can't open files due to permission problems. This can be fixed with the following command: **# chmod 711 /usr/spool/uucp/{C.,D.,D.*systemname*}** Thirdly, one important point omitted from the discussion of setting up your modem for both dial-out and dial-in on the same serial port (Section 5.4.1), is that the flags bit in the kernel corresponding to the serial port you're trying to set up has to be zero. This enables hardware carrier detect, so the Sun can tell when someone dials in or hangs up. If bit i of flags is set to 1, this tells the kernel that line i should be treated as hard-wired with carrier always present. In the case of device ***zs0***, bit 0 (the 1's bit) represents ***ttya*** and bit 1 (the 2's bit) represents ***ttyb***. The default value of flags for ***zs0*** in the GENERIC kernel is 3, indicating software carrier for both ports a and b. To permit hardware carrier on ***ttya***, flags should be changed to 2 or 0. You must also have the modem cabled correctly to the workstation: you need a cable with pins 1 through 8 and pin 20 all wired straight through. A full 25-pin ribbon cable also will work. Another omission from this discussion concerns Ven-Tel modems. If you're using the Ven-Tel MD-212 modem for both dial-in and dial-out on the same serial port, you must have "WECO PROMs" in the modem (the term "WECO" refers to "Western Electric COmpany"). The default firmware that comes with the Ven-Tel modem is non-WECO because it disables some of the the standard modem control signals. You can obtain the WECO PROMs by contacting Ven-Tel in Santa Clara, CA, (408)727-5721. The foregoing discussion only applies if you are setting up a modem for both dial-in and dial-out on the same serial port. If you only want to dial-out, you should skip step 7 of the instructions in Section 5.4.1 (which tells you to edit ***/etc/ttys*** to enable logins on ***/dev/ttyd0***). The last paragraph of this section describes the procedure for setting up the line only to receive calls.
(8)23a	Page for ***dkinfo***(8) was not included in the 1.1 Manual.

Page(s)	Comments
7-18, 7-19	In Section 7.11 on ***Asynchronous Serial Ports***, the SCSI I/O channels and their connectors were mismatched. The final text on page 7-18 **SHOULD** read: "On the SCSI Board, I/O channels C and D appear on connector **J2** (SIO-S2 and SIO-S3 respectively); channels E and F appear on 50-pin connector **J1** (SIO-S0 and SIOS-1 respectively)." On page 7-19, the tables for J1 and J2 are reversed.

Errata in the 1.1 Release

of the

System Manager's Manual for the Sun Workstation — Models 100U/150U

Page(s)	Comments
na	Kernel Configuration. In Section 4.3.12, the documentation says that the **pseudo-device ether** line is not needed in the configuration file for Workstations without Ethernet interfaces. Due to a bug in the current release, however, this line is currently mandatory for all systems, whether or not they have an Ethernet Board. If the line is left out, your subsequent ***make*** will fail with "`undefined _arpioctl error code 1`" and the resulting kernel won't boot.
na	Kernel Configuration. If you edit the ***/sys/h/param.h*** file to tune your kernel configuration, you must ***touch***(1) ***sys/KERNEL/param.c*** immediately afterwards for the changes to come into effect.
na	***vfont*** files. The ***vfont*** files were included in the 1.1 Release. They are in the same ***tar*** file as the demos, manuals, and games. To load the files, see Section 4.3.13.
na	Sky Board. If you include a Sky Board in your Sun system, and you reboot before running the command '`MAKEDEV sky`', you must **either** reboot again **or** run the ***/etc/skyinit*** program after doing the '`MAKEDEV sky`' to load in the Sky Microcode. Proceed as follows: **# cd /dev** **# MAKEDEV sky** **# cd /etc** **# skyinit** [*message to the effect that x # words of microcode loaded*]
4-15, 4-19, 4-22, 4-23, 4-25, 4-28	In Section 4.3.10, ***Using Setup to Configure Your System***, the minimum and default sizes of the ***/pub*** partition as it is allocated by the ***setup*** program during first time UNIX installation was misquoted: the documentation says minimum ***/pub*** is 17 MBytes and default is 20 MBytes; minimum is in fact 20 MBytes, and default is in fact 24 MBytes.
4-30	Immediately before ***Booting the Full UNIX System*** (Section 4.3.11), you must install the Mail System as described in Chapter 5, ***System Set-up and Operation***. Complete AT LEAST Sections 6.2, 6.2.1, 6.2.2, and 6.2.2.1 of Mail set-up. If you do not install ***/usr/lib/sendmail.cf*** before coming up multi-user, ***sendmail*** will try to run without the necessary files, and will leave one ***qf*** . . . and one ***af*** . . . file in the root directory.
6-10	Section 6.2.2.2, ***Telling Sendmail your Domain Name***, includes a procedure for using the "CV" line in ***sendmail.cf*** for local mail routing. This feature does not currently work (bug).

Page(s)	Comments
7-2, 7-3	Section 7.1 (***Step 1: What to Save***) of the ***Upgrading System Software*** Chapter gives incorrect command syntax for ***tar*** file extraction from machines without local tape drives. Text for numbered step 1 reads: **# cd /** **# tar cfb** – *block_size* **dev/r***tape#* **.??* dev/MAKEDEV.local** **etc lib usr/include usr/lib | rsh** *remote_host* **dd of=/dev/***tape#* **obs=***block_size***b** It SHOULD read: **# cd /** **# tar cfb** – *block_size* **.??* dev/MAKEDEV.local** **etc lib usr/include usr/lib | rsh** *remote_host* **dd of=/dev/***tape#* **obs=***block_size***b** Text for numbered step 2 reads: **# tar cfb** – *block_size* **dev/r***tape#* **usr/{spool,local,** *usera,userb,userc,userd...}* **|** **rsh** *remote_host* **dd of=/dev/***tape#* **obs=***block_size***b** It SHOULD read: **# tar cfb** – *block_size* **usr/{spool,local,** *usera, userb,userc, userd...}* **|** **rsh** *remote_host* **dd of=/dev/***tape#* **obs=***block_size***b** In both cases, the "dev/***rtape#***" before the pipeline is unnecessary.
4-7, 4-8, 4-10, 4-30, 5-5	A new version of ***diag*** with enhanced diagnostic and bad-block-handling capabilities is being shipped with the 1.3 distribution software. If you are installing a system with a new disk, use the instructions in Chapter 3 of this document with your 1.1 manual during installation; they will take care of the changes to noted pages.
5-4	There are two syntax errors in the section 5.3, ***Setting up the Remote Host.*** The lines given for ***nd.local*** are: **user 0 0 /dev/***disk***0g –1 –1 –1** **son** They SHOULD be: **user 0 0 /dev/***disk***0g 0 –1 –1** **son** Secondly, the MAKEDEV command reads: **# MAKEDEV nd** It SHOULD read: **# MAKEDEV nd10**

Page(s)	Comments
6-16	There are three major items relating to UUCP. First, on page 6-16, the syntax for step 6 of UUCP installation is incorrect. Text for step 6 SHOULD read: Create the appropriate device for your modem with the following series of commands: **# cd /dev** **# mknod cua0 c 12 128** **# chmod 600 cua0** **# chown uucp cua0** **# mv ttya ttyd0** The third line of the original series of commands has been deleted. Note that this command series supersedes the series printed in the ***Technical Support Bulletin*** Issue 1984-4 of 23 July 1984 (item 4.2), in which the final line designated a **ln** command rather than a **mv**. Secondly, ***uuxt*** may fail because it can't open files due to permission problems. This can be fixed with the following command: **# chmod 711 /usr/spool/uucp/{C.,D.,D.*systemname*}** Thirdly, one important point omitted from the discussion of setting up your modem for both dial-out and dial-in on the same serial port (Section 6.4.1), is that the flags bit in the kernel corresponding to the serial port you're trying to set up has to be zero. This enables hardware carrier detect, so the Sun can tell when someone dials in or hangs up. If bit i of flags is set to 1, this tells the kernel that line i should be treated as hard-wired with carrier always present. In the case of device ***zs0***, bit 0 (the 1's bit) represents ***ttya*** and bit 1 (the 2's bit) represents ***ttyb***. The default value of flags for ***zs0*** in the GENERIC kernel is 3, indicating software carrier for both ports a and b. To permit hardware carrier on ***ttya***, flags should be changed to 2 or 0. You must also have the modem cabled correctly to the workstation: you need a cable with pins 1 through 8 and pin 20 all wired straight through. A full 25-pin ribbon cable also will work. Another omission from this discussion concerns Ven-Tel modems. If you're using the Ven-Tel MD-212 modem for both dial-in and dial-out on the same serial port, you must have "WECO PROMs" in the modem (the term "WECO" refers to "Western Electric COmpany"). The default firmware that comes with the Ven-Tel modem is non-WECO because it disables some of the the standard modem control signals. You can obtain the WECO PROMs by contacting Ven-Tel in Santa Clara, CA, (408)727-5721. The foregoing discussion only applies if you are setting up a modem for both dial-in and dial-out on the same serial port. If you only want to dial-out, you should skip step 7 of the instructions in Section 6.4.1 (which tells you to edit ***/etc/ttys*** to enable logins on ***/dev/ttyd0***). The last paragraph of this section describes the procedure for setting up the line only to receive calls.
(8)23a	Page for ***dkinfo***(8) was not included in the 1.1 Manual.

Chapter 8

Insert Pages for 1.1 Reference Manuals

The following pages are reference manual pages — that is, manual pages from the sections numbered 1 through 8 of the 1.1 Release ***User's Manual for the Sun Workstation*** (Part Number: 800-1107-01), the ***System Interface Manual for the Sun Workstation*** (Part Number: 800-1108-01), ***System Manager's Manual for the Sun Workstation*** (Part Numbers: 800-1109-01 [100U/150U] and 800-1110-01 [120/170]), and *FORTRAN and Pascal for the Sun Workstation* (Part Number: 800-1114-01) — which have been written since the 1.1 Release, have been revised since 1.1, or which were unintentionally not included in the 1.1 manuals.

How you handle the pages is up to you. We recommend inserting them in your 1.1 manuals (copying them if necessary); they are numbered accordingly.

New Pages

screendump(1)	—	dump frame buffer image
screenload(1)	—	restore frame buffer image
cgtwo(4S)	—	Sun-2 color graphics interface
ie(4S)	—	Sun-2 10 Mb/s Ethernet interface
ftpusers(5)	—	list of users prohibited by ftp
skyversion(8)	—	print the SKYFFP board microcode version number
dkinfo(8)	—	report information about a disk's geometry and partitioning

Revised Pages

as(1)	—	mc68000 assembler [Note that the 50 character name limit has extended to 512 characters.]
cc(1)	—	C compiler
clear(1)	—	clear screen [Includes new −c option for clearing color map.]
cpp(1)	—	C language preprocessor
mt(1)	—	magnetic tape manipulating program [Includes new retensioning option.]
tip(1C)	—	connect to a remote system [Revised to reflect bug fixes; updated]

malloc(3) — memory allocator
[The page included in the 1.1 manual described a non-existent routine.]

mem(4S) — main memory and bus I/O space
[Now includes description of special files for VME bus support.]

zs(4S) — zilog 8530 SCC serial comunications driver
[Now includes information on dial-in/dial-out support on the same line.]

diag(8S) — stand-alone disk initialization and diagnosis
[Revised to reflect additional capabilites of new version.]

Omitted Pages

acct(5) — execution accounting file

utmp(5) — login records

bessel(3F) — bessel functions

bit(3F) — setbit functions

time(3F) — return system time

rand(3F) — return random values

etime(3F) — return elapsed execution time

fdate(3F) — return date and time in an ASCII string

stat(3F) — get file status

long(3F) — integer object conversion

NAME

screendump – dump frame buffer image

SYNOPSIS

screendump [**–c**] [**–f** *display*]

DESCRIPTION

Screendump reads out the contents of the console frame buffer (*/dev/fb*) on any model of Sun Workstation and outputs the display image in Sun standard rasterfile format (see */usr/include/rasterfile.h*) on the standard output.

By default, *screendump* attempts first to output the contents of the console frame buffer. If no console frame buffer is found, *screendump* attempts to output the contents of a color frame buffer. The **–c** option selects a color frame buffer directly. Heuristics are applied to locate the color frame buffer the user is most likely interested in. The **–f** option explicitly sets the name of the desired frame buffer device.

The utility program *screenload* displays Sun standard rasterfiles on an appropriate Sun Workstation monitor. Output filters exist for printing standard monochrome rasterfiles on Versatec V-80 electrostatic plotters.

OPTIONS

–c Dump a color frame buffer without trying the console frame buffer.

–f *display*
Use *display* as the device name of the display.

EXAMPLES

tutorial% **screendump >save.this.image**

writes the current contents of the console frame buffer into the file *save.this.image*.

tutorial% **screendump –f /dev/cgone0 >save.color.image**

writes the current contents of the frame buffer */dev/cgone0* into the file *save.color.image*. This has the same effect as the **–c** option for the most common display configuration.

tutorial% **screendump ¦ lpr –Pversatec –v**

sends a rasterfile containing the current frame buffer to the lineprinter, selecting the printer named "versatec" and the "v" output filter (see */etc/printcap*).

FILES

/dev/fb	Default name of console display frame buffer.
/dev/cgone0	Default name of the Sun-1 color display frame buffer.

SEE ALSO

screenload(1), lpr(1)

NAME

screenload – restore frame buffer image

SYNOPSIS

screenload [**–d**] [**–f** *display*] [**–i***index*] [**–b**] [**–g**] [**–w**] [**–h#** [#### [...]]] [file]

DESCRIPTION

Screenload accepts input in Sun standard rasterfile format (see */usr/include/rasterfile.h*) and attempts to display the input on the appropriate monitor (monochrome or color). *Screenload* normally displays rasterfiles on the console display, but displays them on some heuristically determined color display if it finds no console display. *Screenload* displays color rasterfiles only on a color monitor. *Screenload* is able to display monochrome rasters on a color display.

If the dimensions of the image contained in the input data are smaller than the actual resolution of the display (e.g. loading a 1024-by-800 Sun-1 image on a 1152-by-900 Sun-2 display), *screenload* centers the image on the actual workstation screen and fills the border area with solid black (by default). Various options may be used to change the fill pattern.

If the dimensions of the image contained in the input data are larger than the actual resolution of the display, *screenload* clips the right and bottom edges of the input image.

If there is an optional filename argument, *screenload* reads its input data from that file. If no filename argument is given, *screenload* reads its input data from the standard input.

The utility program *screendump* creates Sun standard rasterfiles from the display on a Sun Workstation monitor.

OPTIONS

–d Verify that display dimensions and input data image dimensions match, and print warning messages if they do not.

–f *display*
Use *display* as the name of the frame buffer device.

–i*index*
If the image is smaller than the display, use *index* (0 <= *index* < 256) as the index value into the color map for the foreground color of the border fill pattern. The default index value is 255.

–b If the input data dimensions are smaller than the display dimensions, fill the border with a pattern of solid ones (*default*). On a monochrome display this results in a black border; on a color display the color map value selected by the **–i** option determines the border color.

–g If the input data dimensions are smaller than the display dimensions, fill the border with a pattern of "desktop grey". On a monochrome display this results in a border matching the background pattern used by the SunWindows system; on a color display the color map value selected by the **–i** option determines the foreground border color, though the pattern is the same as on a monochrome display.

–w If the input data dimensions are smaller than the display dimensions, fill the border with a pattern of solid zeros. On a monochrome display this results in a white border; on a color display the color map value at index 0 determines the border color.

–h# If the input data dimensions are smaller than the display dimensions, fill the border with the bit pattern described by the following # 16-bit hexadecimal constants. Note that a "1" bit is black and a "0" bit is white on the monochrome display; on a color diplay the color map value selected by the **–i** option determines the border foreground color. The number of hex constants in the pattern is limited to 16.

EXAMPLES

tutorial% **screenload saved.display.image**

reloads the raster image contained in the file *saved.display.image* on the display type indicated by the rasterfile header in that file.

tutorial% **screenload −f/dev/cgone0 monochrome.image**

reloads the raster image in the file *monochrome.image* on the frame buffer device */dev/cgone0.*

tutorial% **screenload −h1 ffff sun_1.saved.image**

is equivalent to the **−b** option (fill border with black), while

tutorial% **screenload −h4 8888 8888 2222 2222 sun_1.saved.image**

is equivalent to the **−g** option (fill border with desktop grey).

FILES

/dev/fb	Default name of console display frame buffer
/dev/cgone0	Default name of SUn-1 color display frame buffer

SEE ALSO

screendump(1)

NAME

cgtwo – Sun-2 color graphics interface

SYNOPSIS

cgtwo0 at mb0 csr vme busmem 0x400000 priority 3

DESCRIPTION

The *cgtwo* interface provides access to the Sun-2 color graphics controller board, which is normally supplied with a 19" 60 Hz non-interlaced color monitor. It provides the standard frame buffer interface as defined in *fbio*(4S).

The hardware consumes 4 megabytes of VME bus address space. The board starts at standard address 0x400000. The board must be configured for interrupt level 3.

FILES

/dev/cgtwo[0-9]

SEE ALSO

mmap(2), fbio(4S)
User's Manual for the Sun-2 Color Graphics Board.

NAME

ie – Sun-2 10 Mb/s Ethernet interface

SYNOPSIS

device ie0 at mb0 csr 0x88000 priority 3
device ie0 at mb0 csr vme virt 0xee3000 priority 3

DESCRIPTION

The *ie* interface provides access to a 10 Mb/s Ethernet network through a Sun-2 controller. For a general description of network interfaces see *if*(4N).

Of the synopsis lines above, the first line specifies the first Sun-2 Ethernet controller on a Sun-2/120 or Sun-2/170; the second line specifies the first Sun-2 Ethernet controller on a Sun-2/50 or Sun-2/160.

The remainder of this information will be provided at a later time.

NAME

ftpusers – list of users prohibited by ftp

SYNOPSIS

/usr/etc/ftpusers

DESCRIPTION

Ftpusers contains a list of users who cannot access this system using the *ftp*(1) program. *Ftpusers* contains one user name per line.

SEE ALSO

ftp(1), ftpd(8C)

NAME

skyversion – print the SKYFFP board microcode version number

SYNOPSIS

/usr/etc/skyversion

DESCRIPTION

skyversion obtains from the SKYFFP board the Sky version number of the microcode currently loaded and prints the result on the standard output.

DIAGNOSTICS

The Sky version number operation code used to implement this command is not available for microcode releases earlier than Sky release 3.00. The result in this case is unpredictable and is either a nonmeaningful version number or a message indicating that no version number is available. Meaningful version numbers are of the form *n.dd* where $n \geq 3$.

NAME

dkinfo – report information about a disk's geometry and partitioning

SYNOPSIS

/etc/dkinfo *disk*[*partition*]

DESCRIPTION

Dkinfo gives the total number of cylinders, heads, and sectors or tracks on the specified *disk*, and gives this information along with the starting cylinder for the specified *partition*. If no *partition* is specified on the command line, *dkinfo* reports on all partitions.

The *disk* specification here is a disk name of the form *xxn*, where *xx* is the controller device abbreviation (ip, xy, etc.) and *n* is the disk number. The *partition* specification is simply the letter used to identify that partition in the standard UNIX nomenclature. For example, '/etc/dkinfo xy0' reports on the first disk in a system controlled by a Xylogics controller; '/etc/dkinfo xy0g' reports on the seventh partition of such a disk.

You must be superuser to run *dkinfo*.

EXAMPLE

A request for information on my local disk, an 84 MByte disk controlled by a Xylogics 450 controller, might look like this:

```
# /etc/dkinfo xy0
xy0: Xylogics 450 controller at addr ee40, unit # 0
586  cylinders 7 heads 32 sectors/track
a: 15884 sectors (70 cyls, 6 tracks, 12 sectors)
   starting cylinder 0
b: 33440 sectors (149 cyls, 2 tracks)
   starting cylinder 71
c: 131264 sectors (586 cyls)
   starting cylinder 0
d: No such device or address
e: No such device or address
f: No such device or address
g: 81760 sectors (365 cyls)
   starting cylinder 221
h: No such device or address
#
```

SEE ALSO

dk(4), diag(8)

NAME

as – mc68000 assembler

SYNOPSIS

as [**–d2**] [**–j**] [**–L**] [**–R**] [**–o** objfile] file

DESCRIPTION

As translates assembly code in the named *file* into executable object code in the specified *objfile*.

All undefined symbols in the assembly are treated as global.

The output of the assembly is left in the file *objfile*. If the **–o** flag is omitted, then file *a.out* is used.

OPTIONS

–d2 Specifies that instruction offsets which involve forward or external references, and which have sizes unspecified in the assembly language are two bytes long. The default is four bytes. See also **–j**.

–L Save defined labels beginning with an 'L', which are normally discarded to save space in the resultant symbol table. The compilers generate such temporary labels.

–j Use short (pc-relative) branches to resolve jump's and jsr's to externals. This is for compact programs which cannot use the **-d2** flag because of large program relocation.

–R Make initialized data segments read-only by concatenating them to the text segments. This eliminates the need to run editor scripts on assembly code to make initialized data read-only and shared.

FILES

/tmp/as* default temporary file

SEE ALSO

ld(1), nm(1), adb(1), dbx(1), a.out(5)
The *"Assembler Reference Manual for the Sun Workstation"* in the Sun *Programming Tools* Manual

BUGS

Should assemble standard input with no arguments.

The Pascal compiler (*pc*(1)) qualifies a nested procedure name by chaining the names of the enclosing procedures. This sometimes results in names long enough to abort the assembler, which currently limits identifiers to 512 characters.

NAME

cc – C compiler

SYNOPSIS

cc [**–c**] [**–g**] [**–go**] [**–w**] [**–p**] [**–pg**] [**–O**[*optflags*]] [**–A***asmflags*] [**–R**] [**–fsingle**] [**–fsky**] [**–S**] [**–E**] [**–C**] [**–o** *output*] [**–D** *name=def*] [**–D** *name*] [**–U** *name*] [**–I** *dir*] [**–B** *string*] [**–t**[**p012**]] file ...

DESCRIPTION

Cc is the UNIX C compiler which translates programs written in the C programming language into executable load modules, or into relocatable binary programs for subsequent loading with the *ld*(1) linker.

OPTIONS

The following options are interpreted by *cc*. See *ld*(1) for load-time options.

–c Compile only: suppress the loading phase of the compilation, and force an object file to be produced even if only one program is compiled.

–g Have the compiler produce additional symbol table information for *dbx*(1). Also pass the **–lg** flag to *ld*(1).

–go Have the compiler produce additional symbol table information in an older format which is used by the *adb*(1) debugger. Also, pass the **–lg** flag to *ld*(1).

–w Suppress warning messages.

–p Produce profiling code to count the number of times each routine is called. If loading takes place, replace the standard startup routine by one that automatically calls *monitor*(3) and use a special profiling library in lieu of the standard C library. When the program is run, the file *mon.out* is created. An execution profile can then be generated by use of *prof*(1).

–pg Produce profiling code in the manner of **–p,** but invokes a run-time recording mechanism that keeps more extensive statistics and produces a *gmon.out* file at normal termination. *gprof*(1) generates an execution profile.

–O [*optflags*]
Use the object code optimizer to improve the generated code. If *optflags* appears, it is included in the command line used to run the optimizer. This can be used to pass it option flags.

–A*asmflags*
Pass *asmflags* to *as* in its command line. For example, **–A–j** can be used to pass the **–j** option, which causes the assembler to use short PC-relative instructions for subroutine calls.

–R Passed on to *as*, making initialized variables shared and read-only.

–fsingle
Use single-precision arithmetic in computations involving only **float** numbers — that is, do not convert everything to **double** which is the default. Note that floating-point parameters are still converted to double-precision, and functions which return values still return double-precision values. Certain programs run much faster using this option, but be aware that some significance can be lost due to lower precision intermediate values.

–fsky Generate code which assumes the presence of a SKY floating-point processor board. Programs compiled with this option can only be run in systems that have a SKY board installed. Programs compiled without the **–fsky** option will use the SKY board if it is present, but won't run as fast as they would if the **–fsky** option were used. If any part of a program is compiled using the **–fsky** option, you must also use this option when

linking with the *cc* command, since a different set of startup routines is used.

–S Compile the named C programs, and leave the assembler-language output on corresponding files suffixed '.s'.

–E Run only the C preprocessor on the named C programs, and send the result to the standard output.

–C Prevent the C preprocessor from removing comments.

–o *output*
Name the final output file *output*. If this option is used, the file *a.out* is left undisturbed.

–D*name=def*
–D*name*
Define *name* to the preprocessor, as if by '#define'. If no definition is given, the name is defined as "1".

–U*name*
Remove any initial definition of *name*.

–I*dir* '#include' files whose names do not begin with '/' are always sought first in the directory of the *file* argument, then in directories named in **–I** options, then in the */usr/include* directory.

–B*string*
Find substitute compiler passes in the files named *string* with the suffixes cpp, ccom and c2. If *string* is empty, use a standard backup version.

–t[**p012**]
Find only the designated compiler passes in the files whose names are constructed by a **–B** option. In the absence of a **–B** option, the *string* is taken to be */usr/new/*. The letter/number combinations that can be specified for the **–t** option have the meanings:

- p *cpp* — the C preprocessor.
- 0 *ccom* — both phases of the C compiler, but not the optimizer.
- 1 Ignored in this system — this option would be for the second phase of a two-phase compiler but in the Sun system, *ccom* includes both phases.
- 2 *c2* — the object code optimizer.

In addition to the many options, *cc* accepts several types of files. Files whose names end with *.c* are taken to be C source programs; they are compiled, and each resulting object program is left in the current directory, with the same name as the source file, except that the *.c* suffix is replaced by *.o*. In the same way, files whose names end with *.s* are taken to be assembly source programs and are assembled, producing a *.o* file.

Other arguments are taken to be loader option arguments, object programs, or libraries of object programs. Unless **–c**, **–S**, or **–E** is specified, these programs and libraries, together with the results of any compilations or assemblies specified, are loaded (in the order given) to produce an executable program named *a.out*. The name *a.out* can be overridden with the loader's **–o***name* option.

If a single C program is compiled and loaded all at once, the intermediate *.o* file is deleted.

FILES

file.c	C source file
file.s	assember source file
file.o	object file
file.a	library of object files
a.out	executable output file

/tmp/ctm?	temporary
/lib/cpp	preprocessor
/lib/ccom	compiler
/lib/c2	optional optimizer
/lib/crt0.o	runtime startoff
/lib/mcrt0.o	startoff for profiling
/usr/lib/gcrt0.o	startoff for gprof-profiling
/lib/fcrt0.o	SKY runtime startoff
/lib/fmcrt0.o	SKY startoff for profiling
/usr/lib/fgcrt0.o	SKY startoff for gprof-profiling
/lib/libc.a	standard library, see *intro*(3)
/usr/lib/libc_p.a	profiling library, see *intro*(3)
/usr/include	standard directory for '#include' files
mon.out	file produced for analysis by *prof*(1)
gmon.out	file produced for analysis by *gprof*(1)

SEE ALSO

B. W. Kernighan and D. M. Ritchie, *The C Programming Language,* Prentice-Hall, 1978
UNIX Programming in *Programming Tools for the Sun Workstation*
monitor(3), prof(1), gprof(1), adb(1), ar(1), ld(1), dbx(1), as(1), diff(1), cpp(1)

DIAGNOSTICS

The diagnostics produced by C itself are intended to be self-explanatory. Occasional obscure messages may be produced by the preprocessor, assembler, or loader.

BUGS

Options which are identical to *cc* options cannot be passed through to the assembler, optimizer, or loader.

NAME

clear – clear screen

SYNOPSIS

clear

DESCRIPTION

Clear clears your screen if this is possible. It looks in the environment for the terminal type and then in */etc/termcap* to figure out how to clear the screen.

OPTIONS

–c Clear the color map on color screens.

FILES

/etc/termcap terminal capability data base

NAME

cpp – the C language preprocessor

SYNOPSIS

/lib/cpp [**–P** **–C** **–U***name* **–D***name* **–D***name=def* **–I***dir*] [ifile [ofile]]

DESCRIPTION

Cpp is the C language preprocessor which is invoked as the first pass of any C compilation using the *cc*(1) command (*cpp* may optionally be invoked as the first pass of a FORTRAN 77 or Pascal compilation — see *f77*(1) or *pc*(1)). Thus the output of *cpp* is designed to be in a form acceptable as input to the next pass of the C compiler. The preferred way to invoke *cpp* is through the *cc*(1) command. See *m4*(1) for a general macro processor.

Cpp optionally accepts two file names as arguments. *Ifile* and *ofile* are respectively the input and output for the preprocessor. They default to standard input and standard output if not supplied.

OPTIONS

–P Preprocess the input without producing the line control information used by the next pass of the C compiler.

–C Pass all comments (except those which appear on *cpp* directive lines) through the preprocessor. By default, *cpp* strips C-style comments.

–U*name*

Remove any initial definition of *name*, where *name* is a reserved symbol that is predefined by the particular preprocessor. The current list of these possibly reserved symbols includes:

operating system:	ibm, gcos, os, tss, unix
hardware:	interdata, pdp11, u370, u3b, vax, mc68000
UNIX System variant:	RES, RT, sun

–D*name*

Define *name* as 1 (one). This is the same as if a **–D***name=1* option had appeared on the *cpp* command line, or as if a **#define name 1** line had appeared in the source file that *cpp* is processing.

–D*name=def*

Define *name* as if by a **#define** directive. This is the same as if a **#define name def** line had appeared in the source file that *cpp* is processing.

–I*dir* Change the algorithm for searching for **#include** files whose names do not begin with **/** to look in *dir* before looking in the directories on the standard list. Thus, **#include** files whose names are enclosed in **""** will be searched for first in the directory of the *ifile* argument, then in directories named in **–I** options, and last in directories on a standard list. For **#include** files whose names are enclosed in **<>**, the directory of the *ifile* argument is not searched. See the section entitled *Details of the CPP Preprocessor*, below, for exact details of the search order.

–R Allow recursive macros.

CPP DIRECTIVES

All *cpp* directives start with lines begun by **#**. The directives are:

#define *name token-string*

Replace subsequent instances of *name* with *token-string*.

#define *name*(*arg*, ..., *arg*) *token-string*

Notice that there can be no space between *name* and the '('. Replace subsequent instances of *name* followed by a '(', a list of comma-separated tokens, and a '(' by *token-string* where each occurrence of an *arg* in the *token-string* is replaced by the

corresponding token in the comma-separated list.

#undef *name*
Forget the definition of *name* (if any) from now on.

#include "*filename*"
#include <*filename*>
Include at this point the contents of *filename* (which is then run through *cpp*). When the <*filename*> notation is used, *filename* is only searched for in the standard places. See the **−I** option above for more detail.

#line *integer-constant* "*filename*"
Generate line control information for the next pass of the C compiler. *Integer-constant* is interpreted as the line number of the next line and *filename* is interpreted as the file where it comes from. If "*filename*" is not given, the current file name is unchanged.

#endif
Ends a section of lines begun by a test directive (**#if**, **#ifdef**, or **#ifndef**). Each test directive must have a matching **#endif**.

#ifdef *name*
The lines following will appear in the output if and only if *name* has been the subject of a previous **#define** without being the subject of an intervening **#undef**.

#ifndef *name*
The lines following will not appear in the output if and only if *name* has been the subject of a previous **#define** without being the subject of an intervening **#undef**.

#if *constant-expression*
Lines following will appear in the output if and only if the *constant-expression* evaluates to nonzero. All binary non-assignment C operators, the **?:** operator, the unary **−**, **!**, and **~** operators are all legal in *constant-expression*. The precedence of the operators is the same as defined by the C language. There is also a unary operator **defined**, which can be used in *constant-expression* in these two forms: **defined (** *name* **)** or **defined** *name*. This allows the effect of **#ifdef** and **#ifndef** in a **#if** directive. Only these operators, integer constants, and names which are known by *cpp* should be used in *constant-expression*. In particular, the **sizeof** operator is not available.

#else Reverses for the following lines the notion of the test directive currently in effect. So if lines previous to this directive are ignored, the following lines will appear in the output, and vice versa.

The test directives and corresponding **#else** directives can be nested.

DETAILS OF THE C PREPROCESSOR

Directory search order for #include files is:

1. the directory of the file which contains the #include request (that is, #include is relative to the file being scanned when the request is made)
2. the directories specified by **−I** options, in left-to-right order.
3. the standard directory(s) (*/usr/include* for the Sun system).

Special Names: Two special names are understood by *cpp*. The name __LINE__ is defined as the current line number (a decimal integer) as known by *cpp*, and __FILE__ is defined as the current file name (a C string) as known by *cpp*. They can be used anywhere (including in macros) just as any other defined name.

A newline terminates a character constant or quoted string.

An escaped newline (that is, a backslash immediately followed by a newline) may be used in the body of a '#define' statement to continue the definition onto the next line. The escaped newline is not included in the macro body.

Comments are removed (unless the **−C** option is used on the command line). Comments are also ignored, except that a comment terminates a token.

Macro formal parameters are recognized in '#define' bodies even inside character constants and quoted strings. The output from:

```
#define foo(a) '\a'
foo(bar)
```

is the seven characters '\bar' (*space*, single-quote, escape character, b, a, r, single-quote). Macro names are not recognized inside character constants or quoted strings during the regular scan. Thus:

```
#define foo bar
printf("foo");
```

does not expand 'foo' in the second line, because it is inside a quoted string which is not part of a '#define' macro definition.

Macros are not expanded while processing a '#define' or '#undef'. Thus:

```
#define foo bletch
#define bar foo
#undef foo
bar
```

produces 'foo'. The token appearing immediately after a '#ifdef' or '#ifndef' is not expanded.

Macros are not expanded during the scan which determines the actual parameters to another macro call. Thus:

```
#define reverse(first,second)second first
#define greeting hello
reverse(greeting,
#define greeting goodbye
)
```

produces ' goodbye' (and warns about the redefinition of 'greeting').

Incompatibility: The slash '/' in 'a=/*b' is interpreted as the first character of the pair '/*' which introduces a comment, rather than as the second character of the divide-and-replace operator '=/'. This incompatibility reflects the change in the C language which made 'a/=*b' the preferred way to write such a statement if the meaning 'a=a/ *b' is intended.

FILES

/usr/include	standard directory for **#include** files

SEE ALSO

cc(1), m4(1).

DIAGNOSTICS

The error messages produced by *cpp* are intended to be self-explanatory. The line number and filename where the error occurred are printed along with the diagnostic.

NOTES

When newline characters were found in argument lists for macros to be expanded, previous versions of *cpp* put out the newlines as they were found and expanded. The current version of *cpp* replaces these newlines with blanks to alleviate problems that the previous versions had when this occurred.

NAME

mt – magnetic tape manipulating program

SYNOPSIS

mt [**–f** *tapename*] *command* [*count*]

DESCRIPTION

mt sends commands to a magnetic tape drive. If *tapename* is not specified, the environment variable TAPE is used; if TAPE does not exist, *mt* uses the device */dev/rmt12*. Note that *tapename* must reference a raw (not block) tape device. By default *mt* performs the requested operation once. Operations may be performed multiple times by specifying *count*.

The available commands are listed below. Only as many characters as are required to uniquely identify a command need be specified.

eof, weof
Write *count* end-of-file marks at the current position on the tape.

fsf Forward space *count* files.

fsr Forward space *count* records.

bsf Back space *count* files.

bsr Back space *count* records.

For the following commands, *count* is ignored:

rewind
Rewind the tape.

offline, rewoffl
Rewind the tape and place the tape unit off-line.

status Print status information about the tape unit.

retension
Retension the tape.

erase Erase the entire tape.

mt returns a 0 exit status when the operation(s) were successful, 1 if the command was unrecognized, and 2 if an operation failed.

FILES

/dev/rmt*	Raw magnetic tape interface
/dev/rar*	Raw Archive cartridge tape interface
/dev/rst*	Raw SCSI tape interface

SEE ALSO

mtio(4), dd(1), ioctl(2), environ(5)

BUGS

Not all devices support all commands. For example, *ar*(4s) and *st*(4s) currently do not support the **fsr, bsf,** or **bsr** commands; but they are the only only ones that currently support the **retension** and **rewind** commands.

NAME

tip, cu – connect to a remote system

SYNOPSIS

tip [**–v**] [*–speed*] system-name
tip [**–v**] [*–speed*] phone-number
cu phone-number [**–t**] [**–s** *speed*] [**–a** *acu*] [**–l** *line*] [**–#**]

DESCRIPTION

Tip and *cu* establish a full-duplex connection to another machine, giving the appearance of being logged in directly on the remote computer. It goes without saying that you must have a account on the machine (or equivalent) to which you wish to connect. The preferred interface is *tip*. The *cu* interface is included for those people attached to the 'call UNIX' command of the version 7 UNIX system. This manual page describes only *tip*.

When *tip* starts up it reads commands from the file *.tiprc* in your home directory. If you use the **–v** option on the *tip* command line, *tip* displays these commands as it executes them. See the discussion on *variables* later on.

Typed characters are normally transmitted directly to the remote machine (which does the echoing as well).

A tilde ('~') appearing as the first character of a line is an escape signal which directs *tip* to perform some special action. *Tip* recognizes the following escape sequences:

~^D ~.
Drop the connection and exit (you may still be logged in on the remote machine).

~c [*name*]
Change directory to *name* (no argument implies change to your home directory).

~! Escape to a shell (exiting the shell returns you to *tip*).

~> Copy file from local to remote.

~< Copy file from remote to local.

~p *from* [*to*]
Send a file to a remote UNIX host. When you use the put command, the remote UNIX system runs the command string

cat > *to*

while *tip* sends it the *from* file. If the *to* file isn't specified, the *from* file name is used. This command is actually a UNIX specific version of the '~>' command.

~t *from* [*to*]
Take a file from a remote UNIX host. As in the put command the *to* file defaults to the *from* file name if it isn't specified. The remote host executes the command string

cat > *from*; echo ^A

to send the file to *tip*.

~| Pipe the output from a remote command to a local UNIX process. The command string sent to the local UNIX system is processed by the shell.

~C Connect a program to the remote machine. The command string sent to the program is processed by the shell. The program inherits file descriptors 0 as remote line input, 1 as remote line output, and 2 as tty standard error.

~# Send a BREAK to the remote system. For systems which don't support the necessary *ioctl* call the break is simulated by a sequence of line speed changes and DEL characters.

~s Set a variable (see the discussion below).

~^Z Stop *tip* (only available when run under the C-Shell).

~? Get a summary of the tilde escapes

Copying files requires some cooperation on the part of the remote host. When a ~> or ~< escape is used to send a file, *tip* prompts for a file name (to be transmitted or received) and a command to be sent to the remote system, in case the file is being transferred from the remote system. The default end of transmission string for transferring a file from the local system to the remote is specified as the 'oe' parameter in the *remote*(5) file, but may be changed by the set command. While *tip* is transferring a file the number of lines transferred will be continuously displayed on the screen. A file transfer may be aborted with an interrupt. An example of the dialogue used to transfer files is given below (input typed by the user is shown in bold face).

arpa% **tip monet**
[connected]
...(*assume we are talking to another UNIX system*)...
ucbmonet login: **sam**
Password:
monet% **cat > sylvester.c**
~> Filename: **sylvester.c**
32 lines transferred in 1 minute 3 seconds
monet%
monet% ~< Filename: **reply.c**
List command for remote host: **cat reply.c**
65 lines transferred in 2 minutes
monet%
...(*or, equivalently*)...
monet% **~p sylvester.c**
...(*actually echoes as ~[put] sylvester.c*)...
32 lines transferred in 1 minute 3 seconds
monet%
monet% **~t reply.c**
...(*actually echoes as ~[take] reply.c*)...
65 lines transferred in 2 minutes
monet%
...(*to print a file locally*)...
monet% ~|Local command: **pr -h sylvester.c | lpr**
List command for remote host: **cat sylvester.c**
monet% **~^D**
[EOT]
...(*back on the local system*)...

The *remote*(5) file contains the definitions for remote systems known by *tip*; refer to the remote manual page for a full description. Each system has a default baud rate with which to establish a connection. If this value is not suitable, the baud rate to be used may be specified on the command line, for example:

tip -300 mds

When *tip* establishes a connection it sends out a connection message to the remote system. The default value for this string may be found in the remote file.

At any time that *tip* prompts for an argument (for example, during setup of a file transfer) the line typed may be edited with the standard erase and kill characters. A null line in response to a prompt, or an interrupt, aborts the dialogue and returns you to the remote machine.

When *tip* attempts to connect to a remote system, it opens the associated device with an exclusive-open *ioctl*(2) call. Thus only one user at a time may access a device. This is to prevent

multiple processes from sampling the terminal line. In addition, *tip* honors the locking protocol used by *uucp*(1C).

AUTO-CALL UNITS

Tip may be used to dial up remote systems using a number of auto-call unit's (ACU's). When the remote system description contains the 'du' attribute, tip uses the call-unit ('cu'), ACU type ('at'), and phone numbers ('pn') supplied. Normally tip displays verbose messages as it dials. See *remote*(5) for details of the remote host specification.

Depending on the type of auto-dialer being used to establish a connection the remote host may have garbage characters sent to it upon connection. The user should never assume that the first characters typed to the foreign host are the first ones presented to it. The recommended practice is to immediately type a 'kill' character upon establishing a connection (most UNIX systems support '@' as the initial kill character).

Tip currently supports the Ventel MD-212+ autodialer modem and the Hayes SmartModem 1200.

REMOTE HOST DESCRIPTIONS

Descriptions of remote hosts are normally located in the system-wide file */etc/remote*. However, a user may maintain personal description files (and phone numbers) by defining and exporting the REMOTE shell variable. The *remote* file must be readable by *tip*, but a secondary file describing phone numbers may be maintained readable only by the user. This secondary phone number file is */etc/phones*, unless the shell variable PHONES is defined and exported. As described in *remote*(5), the *phones* file is read when the host description's phone number(s) capability is an '@'. The phone number file contains lines of the form:

```
system-name    phone-number
```

Each phone number found for a system is tried until either a connection is established, or an end of file is reached. Phone numbers are constructed from '0123456789-=*', where the '=' and '*' are used to indicate a second dial tone should be waited for (ACU dependent).

TIP INTERNAL VARIABLES

Tip maintains a set of variables which are used in normal operation. Some of these variables are read-only to normal users (root is allowed to change anything of interest). Variables may be displayed and set through the '~s' escape. The syntax for variables is patterned after *vi*(1) and *mail*(1). Supplying 'all' as an argument to the set command displays all variables that the user can read. Alternatively, the user may request display of a particular variable by attaching a '?' to the end. For example 'escape?' displays the current escape character.

Variables are numeric, string, character, or Boolean values. Boolean variables are set merely by specifying their name. They may be reset by prepending a '!' to the name. Other variable types are set by appending an '=' and the value. The entire assignment must not have any blanks in it. A single set command may be used to interrogate as well as set a number of variables.

Variables may be initialized at run time by placing set commands (without the '~s' prefix) in a *.tiprc* file in one's home directory. The **-v** option makes *tip* display the sets as they are made. Comments preceded by a '#' sign can appear in the *.tiprc* file.

Finally, the variable names must either be completely specified or an abbreviation may be given. The following list details those variables known to *tip*, their abbreviations (surrounded by brackets), and their default values. Those variables initialized from the remote file are marked with a '*'. A mode is given for each variable — capitalization indicates the read or write capability is given only to the super-user.

Variable	Type	Mode	Default	Description
[be]autify	bool	rw	true	discard unprintables when scripting

[ba]udrate	num	rW	*	connection baud rate
[c]har[delay]	num	rw	0	character delay for file transfers to remote (cl)
[dial]timeout	num	rW	60	timeout (seconds) when establishing connection
[di]sconnect	str	rw	""	string to send to disconnect (di)
[ec]hocheck	bool	rw	false	
[eofr]ead	str	rw	*	char's signifying EOT from the remote host
[eofw]rite	str	rw	*	string sent for EOT
[eol]	str	rw	*	end of line indicators
[es]cape	char	rw	'~'	command prefix character
[et]imeout	num	rw	10	echo check timeout (et)
[ex]ceptions	str	rw	"\t\n\f\b"	char's not discarded due to beautification
[fo]rce	char	rw	''	force character
[fr]amesize	num	rw	*	size of buffering between writes on reception
[h]alf[d]uple[x]		bool	rw	falsehost is half duplex — do local echo (hd)
[ho]st	str	r	*	name of host connected to
[l]ine[delay]	num	rw	0	line delay for transfers to remote (dl)
[l]ocal[e]cho	bool	rw	false	synonym for halfduplex
[lock]	str	RW	"/tmp/aculock"	lock file for ACU logging
[log]	str	RW	"/usr/adm/aculog"	ACU log file
[par]ity	str	rw	"none"	parity to be generated (pa)
[phones]	str	r	"/etc/phones"	file for hidden phone numbers
[pr]ompt	char	rW	'\n'	end of line indicator set by host
[ra]ise	bool	rw	false	upper case mapping switch
[r]aise[c]har	char	rw	''	interactive toggle for raise
[raw]ftp	bool	rw	false	send all characters during file transfer (rw) do not filter non-printable characters do not do translations like \n to \r.
[rec]ord	str	rw	"tip.record"	name of script output file
[remote]	str	r	"/etc/remote"	system description file
[sc]ript	bool	rw	false	session scripting switch
[tab]expand	bool	rw	false	expand tabs during file transfers
[ta]ndem	bool	rw	true	use XON/XOFF flow control (ta and nt)
[verb]ose	bool	rw	true	make noise during file transfers
[SHELL]	str	rw	"/bin/sh"	name of shell for ~! escape
[HOME]	str	rw	""	home directory for ~c escape

ENVIRONMENT VARIABLES

The following variables are read from the environment:

REMOTE The location of the *remote* file.

PHONES The location of the file containing private phone numbers.

HOST A default host to connect to.

HOME One's log-in directory (for chdirs).

SHELL The shell to fork on a '~!' escape.

FILES

~/.tiprc initialization file.
/usr/spool/uucp/LCK..* lock file to avoid conflicts with *uucp*

DIAGNOSTICS

Diagnostics are, hopefully, self explanatory.

SEE ALSO

remote(5), phones(5)

BUGS

Note that ***chardelay*** and ***linedelay*** are currently not implemented.

NAME

malloc, free, realloc, calloc, cfree, alloca — memory allocator

SYNOPSIS

```
char *malloc(size)
unsigned size;

free(ptr)
char *ptr;

char *realloc(ptr, size)
char *ptr;
unsigned size;

char *calloc(nelem, elsize)
unsigned nelem, elsize;

cfree(ptr)
char *ptr;

char *alloca(size)
int size;
```

DESCRIPTION

Malloc, free, realloc, calloc, and *cfree* provide a simple, general-purpose, heap memory allocation package. *Alloca* provides a way to allocate additional stack space for the current procedure.

Malloc returns a pointer to a block of at least *size* bytes beginning on a word boundary.

The argument to *free* is a pointer to a block previously allocated by *malloc, realloc,* or *calloc*; this space is made available for further allocation, but its contents are left undisturbed.

Needless to say, grave disorder will result if the space assigned by *malloc, realloc,* or *calloc* is overrun, or if some random number is handed to *free*.

Malloc allocates the first big enough contiguous reach of free space found in a circular search from the last block allocated or freed, coalescing adjacent free blocks as it searches. It calls *sbrk* (see *brk*(2)) to get more memory from the system when there is no suitable space already free.

Realloc changes the size of the block pointed to by *ptr* to *size* bytes and returns a pointer to the (possibly moved) block. The contents will be unchanged up to the lesser of the new and old sizes.

Realloc also works if *ptr* points to a block freed since the last call of *malloc, realloc* or *calloc*; however, this practice is highly implementation-dependent and is not recommended.

Calloc allocates space for an array of *nelem* elements of size *elsize*. The space is initialized to zeros, and can be freed with *free* or *cfree*.

Alloca allocates *size* bytes of space in the stack frame of the caller. This temporary space is automatically freed when the caller returns.

Each of the allocation routines returns a pointer to space suitably aligned (possibly after pointer coercion) for storage of any type of object.

DIAGNOSTICS

Malloc, realloc and *calloc* return a null pointer (0) if there is no available memory or if the heap has been detectably corrupted by storing outside the bounds of a block. *Malloc* may be recompiled to check the heap stringently on every transaction; those sites with a source code license may check the source code to see how this can be done.

BUGS

When *realloc* returns 0, the block pointed to by *ptr* may be destroyed.

The current incarnation of the allocator is unsuitable for direct use in a large virtual memory environment where many small blocks are to be kept, since it keeps all allocated and freed blocks on a single circular list. Just before more memory is allocated, all allocated and freed blocks are referenced; this can cause a huge number of page faults.

Alloca is machine-dependent; its use is discouraged.

NAME

mem, kmem, mbmem, mbio, vme16, vme24 – main memory and bus I/O space

SYNOPSIS

None; included with standard system.

DESCRIPTION

These devices are special files that map memory and bus I/O space. They may be read, written, seek'ed and (except for kmem) *mmap*(2)'ed.

Mem is a special file that is an image of the physical memory of the computer. It may be used, for example, to examine (and even to patch) the system.

Kmem is a special file that is an image of the kernel virtual memory of the system.

Mbmem is a special file that is an image of the Multibus memory of the system. Multibus memory is in the range from 0 to 1 Megabyte.

Mbio is a special file that is an image of the Multibus I/O space. Multibus I/O space extends from 0 to 64K.

Vme16 is a special file that is an image of the VME 16-bit address space, extending from 0 to 64K.

Vme24 is a special file that is an image of the VME 24-bit address space, extending from 0 to 16 Megabytes. The VME 16-bit address space overlaps the top 64K of the 24-bit address space.

Mbmem and *mbio* can only be accessed in Multibus based systems; *vme16* and *vme24* can only be accessed in VME based systems.

When reading and writing mbmem and mbio odd counts or offsets cause byte accesses and even counts and offsets cause word accesses.

FILES

/dev/mem
/dev/kmem
/dev/mbmem
/dev/mbio
/dev/vme16
/dev/vme24

NAME

zs – zilog 8530 SCC serial comunications driver

SYNOPSIS

device zs0 at mb0 csr 0xf5a000 flags 3 priority 6

DESCRIPTION

The Zilog 8530 provides 2 serial communication lines with full modem control. Each line behaves as described in *tty*(4). Input and output for each line may independently be set to run at any of 16 speeds; see *tty*(4) for the encoding.

Bit *i* of flags may be specified to say that a line is not properly connected, and that the line *i* should be treated as hard-wired with carrier always present. Thus specifying "flags 0x2" in the specification of zs0 would cause line ttyb to be treated in this way.

To allow a single tty line to be connected to a modem and used for both incoming and outgoing calls, a special feature, controlled by the minor device number, has been added. Minor device numbers in the range 0 – 127 correspond directly to the normal tty lines and are named *tty**. Minor device numbers in the range 128 – 256 correspond to the same physical lines as those above (i.e. the same line as the minor device number minus 128) and are (conventionally) named *cua**. The *cua* lines are special in that they can be opened even when there is no carrier on the line. Once a *cua* line is opened, the corresponding tty line can not be opened until the *cua* line is closed. Also, if the *tty* line has been opened successfully (usually only when carrier is recognized on the modem) the corresponding *cua* line can not be opened. This allows a modem to be attached to */dev/ttya* (usually renamed to */dev/ttyd0*) and used for dialin (by enabling the line for login in */etc/ttys*) and also used for dialout (by *tip*(1C) or *uucp*(1C)) as */dev/cua0* when no one is logged in on the line. Note that the bit in the flags word in the config file (see above) must be zero for this line.

FILES

/dev/tty[a,b,s0-s3]
/dev/ttyd[0-9,a-f]
/dev/cua[0-9,a-f]

SEE ALSO

tty(4)
Zilog Z8030/Z8530 SCC Serial Communications Controller (Sun 800-1052-01)

DIAGNOSTICS

zs%d%c: silo overflow. The character input silo overflowed before it could be serviced.

NAME

diag – stand-alone disk initialization and diagnosis

SYNOPSIS

b stand/diag

DESCRIPTION

Diag is a general-purpose stand-alone utility package for disk initialization and diagnosis. *Diag* supports the various SMD and ST-506 disk controllers.

Note: that *diag* can only be called from the Sun Workstation PROM monitor — *diag* is not a system utility.

The most common use of *diag* is formatting and labelling a disk — see the *format*, *label*, and *partition* commands.

Diag is interactive — it prompts for options and arguments. There are two phases to using *diag*: in the first phase, *diag* prompts for information about the type of disk drive and controller that it is working with, and essentially 'configures' itself to work with that disk and controller. At the end of this phase, *diag* tries to access the disk controller you have defined. If the attempt succeeds, *diag* gives you a status report on the disk and gives you a 'diag>' prompt; this signals the beginning of *diag*'s second phase. If the attempt to access the controller fails (if the controller is mis-defined or non-existent, for example), you get a bus error message, and return to the PROM monitor.

During *diag*'s second phase, you can use the commands listed below in response to the 'diag>' prompt. Only enough characters to uniquely identify the command need be typed. The commands that *diag* currently recognizes are:

abortdma Aborts/does not abort the *dmatest* command when a data miscompare is detected. That is, if the internal variable set by *abortdma* is 'on' (default), the *dmatest* command aborts as soon as it finds an error; otherwise, the *dmatest* continues.

clear Sends a restore command to a disk. This is needed to manually reset disk faults.

diag Re-initializes the *diag* program itself — goes back to phase one of the initialization process described above.

dmatest Begins a continuous DMA test. The test copies random data to and from the designated controller, comparing data. If a miscompare is found, an error message is displayed and the test aborts (unless the *abortdma* command is used — see *abortdma*, above). **Note**: this command is available only with the Xylogics 450 Controller.

errors Reports/does not report all errors as they occur (toggles; default is reporting off).

fix Formats and verifies a range of tracks; any defective tracks/sectors found are automatically corrected using mapping or slipping. **Note:** this command is available for SMD controllers only.

format For SMD disks, formats the entire disk; for SCSI disks, initiates the SCSI *format* program.

help or **?** Displays a list of the available commands.

info Reports/suppresses report of all disk activity as it completes (toggles; default is reporting off).

label Labels the disk.

map Displays current mappings and allows you to explicitly map one track/sector to a different track/sector. Usually used for manual bad sector mapping. The *format* and *fix* commands usually do this automatically when a bad track/sector is found. **Note:** the *map* command is disk controller-dependent: you can *map* tracks with an

Interphase controller, and sectors with Xylogics controllers. This command is not available for use with Adaptec disk controllers (ST-506 interface).

mapcheck Enables/disables checking for overlapping mapped sectors/tracks during the *position*, *read*, *test*, or *write* commands. If the internal variable set by *mapcheck* is 'on' when an error occurs (default), then the current mappings (if any) are read from the disk and checked to see if there are overlapping mappings over the area of the disk where the transfer failed.

partition Creates, assigns, or modifies logical partition tables for a disk. The UNIX operating system requires logical partitions. The *label* command writes the partition map to the disk. There are standard partition tables for each type of disk that *diag* knows about.

position Continuously tests the disk by reading random sectors from the disk. To abort the test, type a **^C** (CONTROL-C).

quit Quits from *diag* and returns to the PROM monitor.

rhdr Reads and displays the track headers for a specified track. **Note:** this command is available for the Xylogics 450 controller only.

read Reads specified blocks from the disk. The *read* command prompts for the starting block number, number of blocks, and the block increment. The *read* command doesn't report the data it reads — it is intended for verifying that blocks are readable.

scan Continuously scans over a range of sectors looking for defective sectors by writing/reading/verifying various bit patterns to sequential sectors. Any data on the disk in the range to be scanned is destroyed. Sectors previously mapped are not scanned, so any errors reported will be newly found defective sectors. If used with a Xylogics controller, defective sectors can be automatically mapped/slipped when they are found. To abort the *scan*, type a **^C** (CONTROL-C).

seek Performs a seek test on the disk: a seek is made to every cylinder and to every possible cylinder distance.

slip Explicitly slips one sector on a track. Usually used for manual bad sector slipping. The *format* and *fix* commands usually do this automatically when bad sectors are found and the proper conditions exist. **Note:** slipping is available only with the Xylogics 450 controller, and only when the disk has a spare data sector per track.

slipmsgs Displays/suppresses display of track headers before and after each slip operation that occurs during the *fix*, *format*, and *slip* commands (toggles; default is display off).

status Reports the ready status of each drive on the current controller.

test Continuously tests the disk by writing random data to random sectors on the disk and then verifying that the correct data can be read back. The *test* command destroys data on the disk. To abort the *test*, type a **^C** (CONTROL-C).

time Turns timing on/off. When timing is on, *diag* reports on how long certain operations take — *diag* is less verbose in this state so it doesn't waste time displaying messages (toggles; default is timing off).

translate Translates a given block number into its decimal value, hexadecimal value, and logical disk address.

verify Reads and displays the label from the disk. Shows the logical partition assignments. This done automatically when the *label* command has labelled the disk.

version Displays the SCCS identification strings for this version of *diag*.

whdr Modifies and writes the track headers for a specified track. **Note:** this command is available with the Xylogics 450 controller only. Also, it should be used only for specialized patching — misuse may destroy track data.

write Verifies that blocks are writable by writing garbage data to specified blocks on the disk. The *write* command prompts for the starting block number, number of blocks, and the block increment.

+ Adds two block numbers and reports the result in decimal, hexadecimal, and as a logical disk address.

– Subtracts two block numbers and reports the result in decimal, hexadecimal, and as a logical disk address.

Block numbers may be entered either as an absolute decimal block number, or as a disk address of the form cylinder/head/sector.

Any *diag* command may be aborted by typing a **^C** (CONTROL-C).

NAME

acct – execution accounting file

SYNOPSIS

#include <sys/acct.h>

DESCRIPTION

The *acct*(2) system call makes entries in an accounting file for each process that terminates. The accounting file is a sequence of entries whose layout, as defined by the include file is:

```
/*      @(#)acct.h 1.1 84/12/20 SMI; from UCB 6.1 83/07/29*/

/*
 * Accounting structures;
 * these use a comp_t type which is a 3 bits base 8
 * exponent, 13 bit fraction "floating point" number.
 */
typedef u_short comp_t;

struct  acct
{
        char        ac_comm[10];  /* Accounting command name */
        comp_t      ac_utime;     /* Accounting user time */
        comp_t      ac_stime;     /* Accounting system time */
        comp_t      ac_etime;     /* Accounting elapsed time */
        time_t      ac_btime;     /* Beginning time */
        short       ac_uid;       /* Accounting user ID */
        short       ac_gid;       /* Accounting group ID */
        short       ac_mem;       /* average memory usage */
        comp_t      ac_io;        /* number of disk IO blocks */
        dev_t       ac_tty;       /* control typewriter */
        char        ac_flag;      /* Accounting flag */
};

#define AFORK    0001           /* has executed fork, but no exec */
#define ASU      0002           /* used super-user privileges */
#define ACOMPAT  0004           /* used compatibility mode */
#define ACORE    0010           /* dumped core */
#define AXSIG    0020           /* killed by a signal */

#ifdef KERNEL
#ifdef SYSACCT
struct  acct        acctbuf;
struct  vnode       *acctp;
#else
#define acct()
#endif
#endif
```

If the process does an *execve*(2), the first 10 characters of the filename appear in *ac_comm*. The accounting flag contains bits indicating whether *execve*(2) was ever accomplished, and whether the process ever had super-user privileges.

SEE ALSO

acct(2), execve(2), sa(8)

NAME

utmp, wtmp – login records

SYNOPSIS

#include <utmp.h>

DESCRIPTION

The *utmp* file records information about who is currently using the system. The file is a sequence of entries with the following structure declared in the include file:

```
/*      @(#)utmp.h 1.1 84/12/20 SMI; from UCB 4.2 83/05/22 */

/*
 * Structure of utmp and wtmp files.
 *
 * Assuming the number 8 is unwise.
 */
struct utmp {
        char    ut_line[8];             /* tty name */
        char    ut_name[8];             /* user id */
        char    ut_host[16];            /* host name, if remote */
        long    ut_time;                /* time on */
};
```

This structure gives the name of the special file associated with the user's terminal, the user's login name, and the time of the login in the form of *time*(3C).

The *wtmp* file records all logins and logouts. A null user name indicates a logout on the associated terminal. Furthermore, the terminal name '~' indicates that the system was rebooted at the indicated time; the adjacent pair of entries with terminal names '|' and '}' indicate the system-maintained time just before and just after a *date* command has changed the system's idea of the time.

Wtmp is maintained by *login*(1) and *init*(8). Neither of these programs creates the file, so if it is removed record-keeping is turned off. It is summarized by *ac*(8).

FILES

/etc/utmp
/usr/adm/wtmp

SEE ALSO

login(1), init(8), who(1), ac(8)

NAME

bessel functions – of two kinds for integer orders

SYNOPSIS

function besj0 (x)

function besj1 (x)

function besjn (n, x)
integer*4 n

function besy0 (x)

function besy1 (x)

function besyn (n, x)
integer*4 n

double precision function dbesj0 (x)
double precision x

double precision function dbesj1 (x)
double precision x

double precision function dbesjn (n, x)
integer*4 n
double precision x

double precision function dbesy0 (x)
double precision x

double precision function dbesy1 (x)
double precision x

double precision function dbesyn (n, x)
integer*4 n
double precision x

DESCRIPTION

These functions calculate Bessel functions of the first and second kinds for real arguments and integer orders.

DIAGNOSTICS

Negative arguments cause *besy0*, *besy1*, and *besyn* to return a huge negative value. The system error code will be set to EDOM (33).

FILES

/usr/lib/libF77.a

SEE ALSO

j0(3m), perror(3F)

NAME

bit – and, or, xor, not, rshift, lshift, bic, bis, bit, setbit functions

SYNOPSIS

(generic) function and (word1, word2)

(generic) function or (word1, word2)

(generic) function xor (word1, word2)

(generic) function not (word)

(generic) function rshift (word, nbits)

(generic) function lshift (word, nbits)

subroutine bic (bitnum, word)
integer*4 bitnum, word

subroutine bis (bitnum, word)
integer*4 bitnum, word

subroutine setbit (bitnum, word, state)
integer*4 bitnum, word, state

logical function bit (bitnum, word)
integer*4 bitnum, word

DESCRIPTION

The *and*, *or*, *xor*, *not*, *rshift*, and *lshift* functions are generic functions expanded inline by the compiler. Their arguments must be **integer** or **logical** values (short or long). The returned value has the data type of the first argument.

and computes the bitwise 'and' of its arguments.

or computes the bitwise 'or' of its arguments.

xor computes the bitwise 'exclusive or' of its arguments.

not returns the bitwise complement of its argument.

lshift is a logical left shift with no end around carry.

rshift is an arithmatic right shift with sign extension. No test is made for a reasonable value of *nbits*.

Bic, *bis*, and *setbit* are external subroutines which operate on integer*4 arguments.

bis sets *bitnum* in *word*.

bic clears *bitnum* in *word*.

setbit sets *bitnum* in *word* to 1 if *state* is nonzero and clears it otherwise.

bit is an external function which tests *bitnum* in *word* and returns .true. if *bitnum* is a 1 (one), and returns .false. if *bitnum* is a 0 (zero).

FILES

/usr/lib/libF77.a

NAME

time, ctime, ltime, gmtime – return system time

SYNOPSIS

integer function time()

character*24 function ctime (stime)
integer*4 stime

subroutine ltime (stime, tarray)
integer*4 stime, tarray(9)

subroutine gmtime (stime, tarray)
integer*4 stime, tarray(9)

DESCRIPTION

Time returns the time since 00:00:00 GMT, Jan. 1, 1970, measured in seconds. This is the value of the UNIX system clock.

Ctime converts a system time to a 24 character ASCII string. The format is described under *ctime*(3). No 'newline' or NULL will be included.

Ltime and *gmtime* disect a UNIX time into month, day, etc., either for the local time zone or as GMT. The order and meaning of the 9 elements returned in *tarray* is described under *ctime*(3).

FILES

/usr/lib/libU77.a

SEE ALSO

ctime(3), idate(3F), fdate(3F)

NAME

rand, drand, irand – return random values

SYNOPSIS

function irand (iflag)

function rand (iflag)

double precision function drand (iflag)

DESCRIPTION

These functions use *random*(3) to generate sequences of random numbers. If *iflag* is '1', the generator is restarted and the first random value is returned. If *iflag* is otherwise non-zero, it is used as a new seed for the random number generator, and the first new random value is returned. The three functions share the same 256 byte state array.

Irand returns positive integers in the range 0 through 2147483647. *Rand* and *drand* return values in the range 0.0 through 1.0 .

FILES

/usr/lib/libF77.a

SEE ALSO

random(3)

NAME

etime, dtime – return elapsed execution time

SYNOPSIS

real function etime (tarray)
real tarray(2)

real function dtime (tarray)
real tarray(2)

DESCRIPTION

These two routines return elapsed runtime in seconds for the calling process. *Dtime* returns the elapsed time since the last call to *dtime*, or the start of execution on the first call.

The argument array returns user time in the first element and system time in the second element. Elapsed time, the returned value, is the sum of user and system time.

The resolution is determined by the system clock frequency.

FILES

/usr/lib/libU77.a

SEE ALSO

getrusage(2)

NAME

fdate – return date and time in an ASCII string

SYNOPSIS

subroutine fdate (string)
character*24 string

character*24 function fdate()

DESCRIPTION

Fdate returns the current date and time as a 24 character string in the format described under *ctime*(3). Neither 'newline' nor NULL will be included.

Fdate can be called either as a function or as a subroutine. If called as a function, the calling routine must define its type and length. For example:

```
character*24  fdate
write(*,*) fdate()
```

FILES

/usr/lib/libU77.a

SEE ALSO

ctime(3), time(3F), idate(3F)

NAME

stat, lstat, fstat — get file status

SYNOPSIS

```
integer function stat (name, statb)
character*(*) name
integer statb(12)

integer function lstat (name, statb)
character*(*) name
integer statb(12)

integer function fstat (lunit, statb)
integer statb(12)
```

DESCRIPTION

These routines return detailed information about a file. *Stat* and *lstat* return information about file *name*; *fstat* returns information about the file associated with fortran logical unit *lunit*. The meaning of the information returned in array *statb* is as described for the structure *stat* under *stat*(2). 'Spare' values are not included, the order is shown below.

The value of either function will be zero if successful; an error code otherwise.

statb(1)	device inode resides on
statb(2)	this inode's number
statb(3)	protection
statb(4)	number of hard links to the file
statb(5)	user-id of owner
statb(6)	group-id of owner
statb(7)	the device type, for inode that is device
statb(8)	total size of file
statb(9)	file last access time
statb(10)	file last modify time
statb(11)	file last status change time
statb(12)	optimal blocksize for file system i/o ops
statb(13)	actual number of blocks allocated

FILES

/usr/lib/libU77.a

SEE ALSO

stat(2), access(3F), perror(3F), time(3F)

BUGS

Pathnames can be no longer than MAXPATHLEN as defined in <sys/param.h>.

NAME

long, short – integer object conversion

SYNOPSIS

integer*4 function long (int2)
integer*2 int2

integer*2 function short (int4)
integer*4 int4

DESCRIPTION

These functions provide conversion between short and long integer objects. *Long* is useful when constants are used in calls to library routines and the code is to be compiled with '–i2'. *Short* is useful in similar context when an otherwise long object must be passed as a short integer.

FILES

/usr/lib/libF77.a

Appendix A

Distribution Tape Reorganization

If you are installing a complete system distribution from 1/4" tape, your 1.1 System Manager's Manual is incorrect about the number of cartridges you should have: the distribution now takes three, rather than two, quarter-inch tape cartridges. **The 1.1 manual is still correct for 1/2" tape distributions.**

The contents of the tape cartridges is:

Table A-1: Contents of Quarter-inch Distribution Tape Cartridges

Tape	*File Number*	*Contents*
Tape 1	1	A general purpose boot program which knows how to boot from the various devices that can be attached to the Sun Workstation. The PROM monitor boots this general purpose boot program.
	2	A copy of the new version of the ***diag*** program. ***diag*** is used during installation to format and label disks. Remember to use the procedures in this 1.4 Manual if you use ***diag*** to initialize a new disk.
	3	A stand alone ***copy*** program which can copy from specified sources to specified destinations.
	4	An image of a miniature version of the root file system, which contains enough information to get something up and running.
	5	Copyright file.
	6	The complete root file system for the UNIX operating system. This is on the tape in ***tar***(1) format and is loaded in by the ***xtr*** or ***rxtr*** utility.
	7	Dummy placeholder. On the 1.1 tapes, this file contained the online manual sources, demos, and games. These have been moved to the third tape cartridge (see below). We put a small file here to maintain the original order of the tape files.
	8	Copyright file.

Tape	*File Number*	*Contents*
Tape 2	1	Copyright file.
	2	A ***tar*** image of the ***/usr*** file system. The ***setup*** program transfers this file system to the disk.
	3	Copyright file.

Tape	*File Number*	*Contents*
Tape 3	1	Copyright file.
	2	Optional software: online manual sources (***/usr/man***), games (***/usr/games***), demonstration executables and source (***/usr/demo***), and font files for the Versatec printer (***/usr/lib/vfont***). You may load any/all of these to your disk(s) if you wish (space permitting); procedures are given below.
	3	Copyright file.

The only part of installation this reorganization affects is the final, optional, step in the 1.1 System Manager's Manual: ***Loading the Manuals, Demos, and Games Directories*** (Section 3.3.13 of the 120/170 Manual; Section 4.3.13 of the 100U/150U Manual). If you wish to load the optional software, use the directory sizes cited and procedures given below rather than those from the 1.1 Manual.

A.1. Loading Optional Software

If you wish to load the manual pages, demos, games, or ***vfont*** files from quarter-inch tape, proceed as follows:

1. Check your available disk space with ***df***(1) to make sure you have adequate storage space for the software you wish to extract. For example:

```
anysys% df
Filesystem              kbytes    used   avail capacity  Mounted on
/dev/xy0a                 7437    6254     439    93%    /
/dev/xy0g                10027    2846    6178    32%    /pub
/dev/xy0d                28351   22786    2729    89%    /usr
/dev/xy0e               122119   47130   62777    43%    /usr2
[and so on]
```

   You can use the following table to estimate how much space is required to store the software on disk. Calculate ± 5%.

Table A-2: Optional Software Storage Requirements

Software	*Size*
Games	1.80 MBytes
Manual pages	2.20 MBytes
lib/vfont files	5.60 MBytes
Demos	4.10 MBytes

2. Load the third cartridge of the distribution tape (you can use a local or remote tape drive), and use ***tar*** with the appropriate keywords (**man**, **demo**, **games**, **lib/vfont**) to extract the software you want. Used without keywords, ***tar*** loads everything in the tape file.

   For a machine with a local tape drive, use the following command series. Remember to substitute the correct device abbreviation (**st** or **ar**) for ***tape***:

```
gaia# cd /usr
gaia# mt -f /dev/nrtape0 rew
gaia# mt -f /dev/nrtape0 fsf 1
gaia# tar xvfb /dev/nrtape0 200 { keyword . . . }
```

   For a machine using a remote tape drive, type the following. Remember to replace ***tape*** with the appropriate device abbreviation for the remote tape drive you are using, and to replace ***remote_host*** with the hostname of the machine this tape drive is attached to:

```
gaia# cd /usr
gaia# rsh remote_host mt -f /dev/nrtape0 rew
gaia# rsh remote_host mt -f /dev/nrtape0 fsf 1
gaia# rsh remote_host dd if=/dev/nrtape0 bs=200b | tar xvBf - {keyword . . . }
```

   You can ignore the "Broken pipe" message delivered after the last command.

O O O