UNIX® SYSTEM V
RELEASE 4
BSD/XENIX® Compatibility Guide

UNIX® System V

UNIX Software Operation
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Introduction

Two major variants of the UNIX Operating System have been merged into System V Release 4. Because of certain conflicts, not all commands of each version of the UNIX System have been merged into the System V base. However, to make the transition as easy as possible, many of these commands have been retained as part of a Compatibility Package.
How This Guide Is Organized

There are two sections in this book. For each of the UNIX variants that have been merged into System V Release 4, this book contains a discussion of the commands, system calls and library routines that were not merged into the base.

Organization of the Sections

Each section in this book contains three parts:

1. overview
2. manual pages
3. subject index

The overview gives a high level description and, in some cases, a tutorial for many of the commands and routines included in the Compatibility Package. It also describes steps you must take to use these commands.

Following the overview, you will find a table of contents and permuted index, and manual pages describing each of the commands, system calls and library routines in the package.

Finally, you’ll find a subject index for both the Berkeley and XENIX sections. Each section is fully and independently indexed. For a comprehensive index, see the Product Overview and Master Index.

Notation Conventions Used in This Guide

This section describes the notation conventions used in this book.

Computer Input and Output

- References to literal computer input and output (such as commands entered by the user or screen messages produced by the system) are shown in a monospace font, as in the following example:
Substitutable text elements (that is, text elements that you are expected to replace with specific values) are shown in an italic font, as in the following example:

```
$ cat filename
```

The italic font is a signal that you are expected to replace the word `filename` with the name of a file.

Comments in a screen display—that is, text that is not computer output, but is an aside from the author to the reader—is shown in an italic font and is indented, as in the following example:

```
command interaction
```

Press RETURN to continue.

Instructions to the reader to type input usually do not include explicit instructions to press the RETURN key at the appropriate times (such as after entering a command or a menu choice) because this instruction is implied for all UNIX system commands and menus.

In one circumstance, however, an instruction to press the RETURN key is explicitly provided: when, during an interactive routine, you are expected to press RETURN without having typed any text, an instruction to do so will be provided, as follows:
Control characters are shown by the string \texttt{CTRL-\textit{char}} where \textit{char} is a character such as "d" in the control character \texttt{CTRL-d}. To enter a control character, hold down the \texttt{CTRL} key and press the letter shown. Be sure to type the letter exactly as specified: when a lower case letter is shown (such as the "d" in the example above), enter that lower case letter. If a character is shown in upper case (such as \texttt{CTRL-D}), you should enter an upper case letter.

The system prompt signs shown in examples of interactive sessions are the standard default prompt signs for AT&T UNIX System V Release 4.0:

- the dollar sign (\$) for an ordinary user
- the pound sign (\#) for the owner of the root login

\textbf{Admonishments}

An admonishment is a short piece of text that is set off from the main body of the text and is marked with an icon to show that it deserves special attention. The only type of admonishment used in this guide is a note.

Text marked with a NOTE icon is material that emphasizes points of interest, presents extended parenthetical information, or cites references to other documents and software. Information contained in a note may help you avoid inconvenience (rather than injury or damage to the system). The following is an example of a NOTE.
To start and stop the LP print service manually, you must be logged in as either root or lp.
Related Documents and Training Courses

For a complete list of books about AT&T UNIX System V Release 4.0, see the Product Overview and Master Index for this release. To order books, call one of the following numbers:

In the continental U.S.: 1-800-432-6600

Outside the continental U.S.: 1-800-256-1242

Outside the U.S.: 317-256-1242

For a complete list of training courses related to AT&T UNIX System V Release 4.0, see one of the following:

AT&T Education and Training Catalog of Courses

AT&T UNIX System V and C Language Training
(brochure)

For information about taking a course, call one of the following numbers:

In the continental U.S.: 1-800-554-6400

Outside the continental U.S.: 201-658-6747
How to Comment on This Guide

We want to provide you with the best possible documents for UNIX System V Release 4.0. If you have suggestions about how we can improve this book, please send them to us by filling out and mailing the card located after the title page.
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Overview

UNIX System V Release 4.0 is, among other changes, a merge of UNIX System V with the enhanced BSD UNIX Operating System. (BSD UNIX is also known as “Berkeley UNIX.”) In most cases these changes have been implemented to preserve compatibility with System V.

However, Release 4.0 includes a “compatibility package” that provides a full BSD environment. It contains the following, which are either different from UNIX System V or don’t exist in UNIX System V Release 4.0:

- **BSD commands.** For example, BSD’s `look` command is not in UNIX System V. Another example is the `df` command, which reports block sizes differently in BSD than in UNIX System V. A third example is the `ln` command; it has a `-f` option that has different meanings in the two environments.

- **Library routines.** For example, `printf` returns different values under BSD and UNIX System V; the BSD routine `re_comp` doesn’t exist in UNIX System V.

- **Header files.** For example, `sysexits.h` doesn’t exist in UNIX System V; and the BSD `sys/file.h` has additional `#defines` not in UNIX System V.

- **System Calls and Signals.** Routines to emulate BSD system calls. For example, the BSD system call, `killpg`, has been implemented as a library routine with the same name.

By using the compatibility package, you can take advantage of full BSD environment compatibility.

**Why Use the Compatibility Package**

Use the compatibility package if you:

- want BSD behavior of commands and routines.

- are more familiar with BSD and want a BSD environment.

- are using programs or shell scripts that make use of BSD commands, libraries, and routines.
Installing the Compatibility Package

The compatibility package is an optional software package. To install the compatibility package, see the Source Code Provision Build Instructions.

Accessing the Compatibility Package

Once the compatibility package is installed, you can make use of it by setting your PATH variable so that /usr/ucb comes before the default UNIX System V path directories /usr/bin and so on. /usr/ucb contains the compatibility package commands.

To find out what your path is currently, use the set command:

```
$ set
EDITOR=/usr/ucb/vi
HOME=/home/medici
LOGNAME=medici
PATH=.:/home/medici/bin:/usr/bin:/usr/ucb:/etc
PWD=/home/medici/att/compat
SHELL=/bin/sh
USER=medici
home=/home/medici
$
```

(Actually, you'll probably get a lot more information than this example shows.) To make the compatibility package commands the default, switch the order of /usr/bin and /usr/ucb:

```
$ PATH=.:/home/medici/bin:/usr/ucb:/usr/bin:/etc
$
```

To make this change permanent, put the above line in your .profile file (in your home directory).
Or your .cshrc file if you're using the C shell.

To avoid seeing all the environment variables you have set, you can use echo.

```
$ echo PATH
PATH=.:~/medici/bin:/usr/bin:/usr/ucb:/etc
$
```

Compatibility package header files and libraries called by the C compiler (cc) and linker (ld) are located in /usr/ucbinclude and /usr/ucblib.

By setting your path as shown above, you'll use /usr/ucb/cc when you compile C programs. /usr/ucb/cc sets its default paths to pick up, in this order:

1. User-specified include directories and libraries;
2. The compatibility include files and directories;
3. The default UNIX System V headers and libraries, if unresolved symbols remain.
Selected Features of the Compatibility Package

Printing Commands

The compatibility package contains five BSD printing commands that are not in the basic UNIX System V: lpr, lpq, lprm, lpc, and lptest. This is how they compare with UNIX System V commands:

<table>
<thead>
<tr>
<th>UNIX System V Equivalents of BSD Printing Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSD Command</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>lpr</td>
</tr>
<tr>
<td>lpq</td>
</tr>
<tr>
<td>lprm</td>
</tr>
<tr>
<td>lpc</td>
</tr>
<tr>
<td>lptest</td>
</tr>
</tbody>
</table>

Each of these BSD commands contained in the compatibility package is explained further in Chapter brief_disc. Here is an overview of some important features:

1. There are no BSD commands for administration, maintenance, or accounting of printers; you must use UNIX System V schemes. The exception is the lpc command, which is included.

2. The BSD printcap file does not exist. Instead, use /usr/share/lib/terminfo.

3. Printing spooling commands do not depend on the lpd daemon, as in BSD. Instead, they use an HPI (High Performance Interface) with the UNIX System V printing daemon, lpsched.

For more information on each of these commands, see Chapter brief_disc.
Text Formatting and Bibliography Commands

The compatibility package includes a complete set of text formatting and bibliography commands. They are explained further in the manuals TEXT and TROFF. Additional information is provided in the Reference section of this document.

<table>
<thead>
<tr>
<th>Text Formatting and Bibliography in the Compatibility Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>checkeq</td>
</tr>
<tr>
<td>checknr</td>
</tr>
<tr>
<td>deroff</td>
</tr>
<tr>
<td>diffmk</td>
</tr>
<tr>
<td>eqn</td>
</tr>
<tr>
<td>eqnchar</td>
</tr>
<tr>
<td>neqn</td>
</tr>
<tr>
<td>nroff</td>
</tr>
<tr>
<td>refer</td>
</tr>
<tr>
<td>soelim</td>
</tr>
<tr>
<td>tbl</td>
</tr>
<tr>
<td>troff</td>
</tr>
</tbody>
</table>

Library Routines and Header Files

The Compatibility Package also includes a set of compatibility libraries. These libraries consist of

a. routines not in UNIX System V, or

b. having a different interface and a different system call "wrapper" than their UNIX System V counterparts.

In the case of header files, differences remain, and the user should make himself or herself aware of them; however, an attempt has been made to achieve real source compatibility.
Mail Commands

The BSD version of mail, based on sendmail, has been included; it has a different user interface than UNIX System V's mail. Additionally, several useful mail facilities are included for compatibility. You should not mix and match commands from the two versions of the mail feature.

<table>
<thead>
<tr>
<th>Mail Commands in the Compatibility Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>biff</td>
</tr>
<tr>
<td>mailstats</td>
</tr>
<tr>
<td>newaliases</td>
</tr>
<tr>
<td>sendmail</td>
</tr>
<tr>
<td>vacation</td>
</tr>
</tbody>
</table>
BSD Compatibility Package Contents

Commands

The following BSD commands are not in UNIX System V Release 4.0 but are part of the Compatibility Package:

Commands Not in UNIX System V:

<table>
<thead>
<tr>
<th>addbib</th>
<th>logger</th>
<th>newfs</th>
<th>syslogd</th>
</tr>
</thead>
<tbody>
<tr>
<td>apropos</td>
<td>look</td>
<td>nroff</td>
<td>tbl</td>
</tr>
<tr>
<td>arch</td>
<td>lookbib</td>
<td>pagesize</td>
<td>tcopy</td>
</tr>
<tr>
<td>biff</td>
<td>lpc</td>
<td>printenv</td>
<td>troff</td>
</tr>
<tr>
<td>catman</td>
<td>lpq</td>
<td>reboot</td>
<td>tset</td>
</tr>
<tr>
<td>checknr</td>
<td>lpr</td>
<td>refer</td>
<td>ul</td>
</tr>
<tr>
<td>diffmk</td>
<td>lprm</td>
<td>renice</td>
<td>unifdef</td>
</tr>
<tr>
<td>fastboot</td>
<td>lptest</td>
<td>reset</td>
<td>uptime</td>
</tr>
<tr>
<td>fsirand</td>
<td>mach</td>
<td>roffbib</td>
<td>users</td>
</tr>
<tr>
<td>halt</td>
<td>mailstats</td>
<td>sccs</td>
<td>w</td>
</tr>
<tr>
<td>hostid</td>
<td>man</td>
<td>sendmail</td>
<td>whatis</td>
</tr>
<tr>
<td>hostname</td>
<td>mt</td>
<td>soelim</td>
<td>which</td>
</tr>
<tr>
<td>indxbib</td>
<td>newaliases</td>
<td>sortbib</td>
<td>whoami</td>
</tr>
</tbody>
</table>
| lastcomm

The following compatibility package commands are different from existing UNIX System V ones:

Commands Varying From UNIX System V

<table>
<thead>
<tr>
<th>basename</th>
<th>echo</th>
<th>ls</th>
<th>shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>cc</td>
<td>eqn</td>
<td>neqn</td>
<td>stty</td>
</tr>
<tr>
<td>checkeq</td>
<td>groups</td>
<td>plot</td>
<td>sum</td>
</tr>
<tr>
<td>chown</td>
<td>grpck</td>
<td>prt</td>
<td>test</td>
</tr>
<tr>
<td>deroff</td>
<td>install</td>
<td>ps</td>
<td>tr</td>
</tr>
<tr>
<td>df</td>
<td>ld</td>
<td>pwck</td>
<td>vacation</td>
</tr>
<tr>
<td>du</td>
<td>ln</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Library Routines

The following compatibility package library routines do not exist in UNIX System V:

<table>
<thead>
<tr>
<th>Library Routines Not in UNIX System V</th>
</tr>
</thead>
<tbody>
<tr>
<td>_longjmp</td>
</tr>
<tr>
<td>_setjmp</td>
</tr>
<tr>
<td>allocator</td>
</tr>
<tr>
<td>alphassort</td>
</tr>
<tr>
<td>bcmp</td>
</tr>
<tr>
<td>bcopy</td>
</tr>
<tr>
<td>bzero</td>
</tr>
<tr>
<td>closelog</td>
</tr>
<tr>
<td>copy</td>
</tr>
<tr>
<td>dbm_clearerr</td>
</tr>
<tr>
<td>dbm_close</td>
</tr>
<tr>
<td>dbm_delete</td>
</tr>
<tr>
<td>dbm_error</td>
</tr>
<tr>
<td>dbm_fetch</td>
</tr>
<tr>
<td>dbm_firstkey</td>
</tr>
<tr>
<td>dbm_nextkey</td>
</tr>
<tr>
<td>dbm_open</td>
</tr>
<tr>
<td>dbm_store</td>
</tr>
<tr>
<td>dbmclose</td>
</tr>
<tr>
<td>dbminit</td>
</tr>
<tr>
<td>decimal_to_double</td>
</tr>
<tr>
<td>decimal_to_extended</td>
</tr>
<tr>
<td>decimal_to_single</td>
</tr>
<tr>
<td>delete</td>
</tr>
<tr>
<td>double_to_decimal</td>
</tr>
<tr>
<td>econvert</td>
</tr>
<tr>
<td>endusershell</td>
</tr>
<tr>
<td>extended_to_decimal</td>
</tr>
<tr>
<td>fconvert</td>
</tr>
<tr>
<td>fdopen</td>
</tr>
<tr>
<td>fetch</td>
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<tr>
<td>ffs</td>
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</tbody>
</table>
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<th>Routine</th>
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<td>sigvec</td>
<td>sys_siglist</td>
<td>utimes</td>
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<tr>
<td>single_to_decimal</td>
<td>syscall</td>
<td>wait3</td>
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<tr>
<td>srandom</td>
<td>syslog</td>
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<tr>
<td>store</td>
<td>timezone</td>
<td>wiFSIGNALED</td>
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<tr>
<td>strcasecmp</td>
<td>ualarm</td>
<td>wiFSTOPPED</td>
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<tr>
<td>strncasecmp</td>
<td>usleep</td>
<td>xtom</td>
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</table>

The following compatibility package library routines are different from those in UNIX System V Release 4.0:

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<th>Routine</th>
<th>Routine</th>
<th>Routine</th>
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<td>fopen</td>
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<td>regex</td>
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<td>longjmp</td>
<td>setbuf</td>
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<td>nice</td>
<td>settimeofday</td>
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<td>wait</td>
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<td>nlist</td>
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<td>alloc</td>
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<td>dbm</td>
<td>dbminit, dbmclose, delete, fetch, firstkey, store, nextkey</td>
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<tr>
<td>decimal_to-floating</td>
<td>decimal_to_single, decimal_to_double, decimal_to_extended</td>
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<tr>
<td>econvert</td>
<td>econvert, fconvert, gconvert, sconvert, sfconvert, sgconvert</td>
</tr>
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<td>floating_to_decimal</td>
<td>single_to_decimal, double_to_decimal, extended_to_decimal</td>
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<td>floatingpoint</td>
<td>floatingpoint</td>
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<td>fopen, freopen, fdopen</td>
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<tr>
<td>ftime</td>
<td>ftime</td>
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<td>Routines</td>
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<td>---------------------------------------</td>
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<td>getdtablesize</td>
<td>getdtablesize</td>
</tr>
<tr>
<td>gethostid</td>
<td>gethostid</td>
</tr>
<tr>
<td>gethostname</td>
<td>gethostname, sethostname</td>
</tr>
<tr>
<td>getpagesize</td>
<td>getpagesize</td>
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<tr>
<td>getpriority</td>
<td>getpriority, setpriority</td>
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<td>getusage</td>
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<td>ieee_handler</td>
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<tr>
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<td>killpg</td>
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<td>mkstemp</td>
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<tr>
<td>mp</td>
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<td>dbm_open, dbm_close, dbm_fetch, dbm_store, dbm_delete, dbm_firstkey, dbm_nextkey, dbm_error, dbm_clearerr</td>
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<td>rand</td>
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<td>random</td>
<td>initstate, setstate, random, srand</td>
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<td>reboot</td>
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<td>signal</td>
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<td>syscall</td>
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<td>times</td>
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<td>usleep</td>
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The following signals are in the compatibility package:

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<th>Signals</th>
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<td>_psignal</td>
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<td>_setjmp</td>
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<table>
<thead>
<tr>
<th>System Calls</th>
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<tbody>
<tr>
<td>getdtablesize</td>
</tr>
<tr>
<td>gethostid</td>
</tr>
<tr>
<td>gethostname</td>
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<tr>
<td>getrusage</td>
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<table>
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<tr>
<td>fp.h</td>
</tr>
<tr>
<td>mp.h</td>
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<tr>
<td>ndbm.h</td>
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</table>

System Calls

The following system calls are in the compatibility package:

<table>
<thead>
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<tbody>
<tr>
<td>getdtablesize</td>
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</tr>
<tr>
<td>getrusage</td>
</tr>
<tr>
<td>gettimeofday</td>
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<tr>
<td>killpg</td>
</tr>
<tr>
<td>reboot</td>
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<tr>
<td>setregid</td>
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Header Files

The following compatibility package header files do not exist in UNIX System V Release 4.0:

<table>
<thead>
<tr>
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<td>dbm.h</td>
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<tr>
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<tr>
<td>fp.h</td>
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<tr>
<td>struct.h</td>
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<tr>
<td>sys/reboot.h</td>
</tr>
<tr>
<td>mp.h</td>
</tr>
<tr>
<td>sunfp.h</td>
</tr>
<tr>
<td>sys/exits.h</td>
</tr>
<tr>
<td>ndbm.h</td>
</tr>
<tr>
<td>sys/ieeefp.h</td>
</tr>
<tr>
<td>ufs/quotah</td>
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</tbody>
</table>
### Header Files Varying from UNIX System V

<p>| | | |</p>
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<tr>
<th></th>
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<tbody>
<tr>
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<td>sys/signal.h</td>
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<tr>
<td>regexp.h</td>
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<td>setjmp.h</td>
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<td>signal.h</td>
<td>sys/param.h</td>
<td>sys/wait.h</td>
</tr>
<tr>
<td>stdio.h</td>
<td>sys/resource.h</td>
<td>unistd.h</td>
</tr>
</tbody>
</table>
**BSD Compatibility Package Commands**

**Data Manipulation**

- **echo**
  
  The BSD and UNIX System V versions of `echo` differ in their handling of the `-n` option, and in the recognition of certain escape sequences.

  The built-in version of `echo` has been modified to have BSD behavior if `/usr/ucb` is placed before `/usr/bin` in the `PATH` environment variable. Since `/usr/bin/echo` has not been modified, a BSD-compatible version of `echo` has been placed in the compatibility package.

- **look**
  
  Looks up a given word or string in the system dictionary. Not in UNIX System V.

- **tr**
  
  Translates characters from the standard input to the standard output. There are two differences between the UNIX System V version and the BSD version:

  - In BSD, when translating from `string1` to `string2`, if `string2` is shorter than `string1`, it `(string2)` is padded out to the length of `string1` by repeating `string2`’s last character.

  - The BSD version does not require enclosing alphanumeric ranges inside square brackets.

**Display**

- **catman**
  
  Creates the preformatted versions of the on-line Manual Pages from their nroff source. Not in UNIX System V.

- **man**
  
  Displays the selected Manual Page. Not in UNIX System V.

- **plot**
  
  Graphics filters for various plotters. This version has more filters than the UNIX System V version, allowing you to run it on more kinds of terminals.
reset and tset
These commands are similar to tput reset and tput init, respectively; that is, they set and reset terminal behavior characteristics. However they differ enough to be included here. reset and tset are not in UNIX System V.

Text Processing and Bibliography

The following commands are all used for formatting text or generating a bibliography. They are described in greater detail in the manuals TEXT and TROFF. (Manual Pages for these commands are also included at the end of this document.) None of the text processing commands is included in UNIX System V’s base.

checkeq Checks that your eqn (described below) input is correct.
checknr Checks your nroff and troff input for errors.
deroff Removes troff and nroff code from documents.
diffmk Compares two nroff or troff source files and makes a third file containing “change mark” (.mc) notations showing where the two files differ.
eqn This is a preprocessor for typesetting mathematical equations. Used with troff.
eqnchar A set of special characters for eqn.
ms, me, and man These are macro packages for use with troff and nroff. man is used for formatting Manual Pages. me and ms are used for formatting technical and general manuscripts, respectively.
neqn Similar to eqn, but for use with nroff instead of troff.
nroff A type processing utility for formatting text to be printed on typewriter-like printers.
**refer**  
A bibliography system supporting data entry, indexing, retrieval, sorting, and footnote or endnote numbering. It is a `nroff` and `troff` preprocessor (like `eqn` or `tbl`). These `refer` commands all relate to creating or maintaining a bibliography:

- `addbib` creates and extends the bibliographic database;
- `indxbib` creates an index to the references;
- `lookbib` quickly retrieves individual citations or groups of citations;
- `roffbib` runs off the entire database, formatting it not as footnotes, but as a bibliography or annotated bibliography;
- `sortbib` sorts the bibliography by author and date, or other criteria.

**soelim**  
Eliminates `.so` requests from `troff` and `nroff` documents. `.so` is used to "source" other documents; that is, you use `.so` when you want the contents of another document read in at that point. However, in some cases using `.so` does not work (such as with `tbl`), and it's better to simply put the sourced document in. `soelim` replaces `.so` requests with the sourced document.

**tbl**  
A text formatting utility for making tables. The tables in this document were created with `tbl`.

**troff**  
A device-independent text formatter for use with phototypesetters. This document was formatted with `troff`.

**ul**  
Designed for CRTs, this command highlights underlined text using a terminal's underline mode, if available, and otherwise reverse video mode.
File Management

**basename** Strips the full path name off a file. If you follow the path name with a suffix, that suffix is stripped, too:

```
$ basename /usr/src/rundog.c .c
rundog
$
```

basename is useful for writing shell scripts.

This version parses differently from the UNIX System V one.

**chown** The compatibility package version allows an optional .group suffix on the user argument, to allow the changing of both owner and group in a single operation.

**ln** Much BSD behavior has been incorporated into the Release 4.0 version of ln. Chiefly, ln in BSD doesn’t remove an existing target, while the version in UNIX System V does, if it has the requisite permissions. Because the BSD behavior is not obtained by default, the compatibility package contains a version of ln, so that no special options are necessary.

**ls** The compatibility package version of ls differs from UNIX System V version in three ways:

- the -s option prints only the user name (not group);
- the -s option reports block sizes in blocks of 1024 bytes, instead of 512;
- this version of ls -F prints an equals sign (=) to indicate AF_UNIX address family sockets.

**sum** This version always calculates checksums in a machine-independent way. Also, it uses 1024-byte (not 512-byte) blocks.
test

The BSD and UNIX System V versions of test differ with respect to the -f option. In BSD, this option means "is the target not-a-directory?" while in UNIX System V it means "is the target a plain file?"

As with echo, the built-in version of test has been modified to have BSD behavior when /usr/ucb is placed before /usr/bin in the PATH environment variable. Since /usr/bin/test has not been modified, a BSD-compatible version of test has been placed in the compatibility package.

which

Tells you which version of a command you normally use:

```
$ which tr
/usr/bin/tr
$
```

There is no equivalent for this command in UNIX System V.

File System Management

df

The most important difference is that block sizes are different from the UNIX System V version; also, this version preserves the -t option to mean "report on filesystems of a given type."

du

Gives the number of disk blocks used by files in a directory. Useful for seeing how disk space is being used. This version uses 1024-byte block sizes, while the UNIX System V version uses 512-byte blocks.
Languages

cc  Compatibility package header files and libraries called by the C compiler (cc) and linker ld) are located in /usr/ucbinclude and /usr/ucblib. The compatibility package version of cc looks in /usr/ucbinclude and /usr/ucblib to find BSD library and header files.

Actually, cc in the compatibility package, is a shell script that sets the paths of the include directories.

1. User-specified include directories and libraries;
2. The compatibility include files and directories;
3. The default UNIX System V headers and libraries, if unresolved symbols remain.

ld  As with cc, a shell script in the compatibility package ensures that libraries in /usr/ucblib are linked in, instead of the default UNIX System V libraries.

When unresolved symbols remain, the libraries in /usr/lib are referenced. Note that /usr/ucblib/libucb.a is always linked when the shell script is invoked.

prt  This SCCS command displays the “delta” and commentary record for an SCCS file. See prs because prt is obsolescent. Not in UNIX System V.

sccs  The front-end program to the Source Code Control System (SCCS). SCCS allows you to restrict access to programs or documents that are being worked on by several people at once. Not in UNIX System V.

unifdef  Strips ifdef statements from C code. Understands ANSI C preprocessor statements. Not in UNIX System V.
Printing Commands

lpc

lpc, the line printer control program, is the same as in BSD except that it does not make use of the file /etc/printcap. Use lpc to start and stop a printer, disable or enable a spooling queue, rearrange the order of printing jobs, or display the status of each printer. Not in UNIX System V.

lpq

lpq is the equivalent of the UNIX System V command lpstat. lpq returns information on all print jobs on the local printer; however, for remote printers, it provides the status only for jobs belonging to the user.

The command lpq username provides the status of all files, on all machines (both local and remote), belonging to the named user. In these examples, user wesson sends files fileX and fileY to the local printer, printerA, and fileZ to a remote printer:

```
$ lpr fileX
$ lpr fileY
$ lpr

 Rank   Owner     Job          Files
 active smith printerA-111230 file1
 1st    wesson  printerA-111231 fileX
 2nd    wesson  printerA-111232 fileY
 3rd    jones   printerA-111233 fileZ
$
```

```
$ lpr -d far_printer fileZ
$ lpr -Pfar_printer

 Rank   Owner     Job          Files
 4th    wesson   far_printer-111332 fileZ
$
```
lpr

The command lpr is the BSD equivalent of the command lp, which is used to send files to a printer. It is the command to use when you need to send a file to the printer. The compatibility package version of lpr does not support the -r option, which removes a file after spooling it. Nor does it allow for specific fonts to be mounted on font positions 1, 2, 3, or 4.

lprm

This is the BSD equivalent of the UNIX System V cancel command. It removes files from the print queue.

lptest

This produces a ripple pattern for testing printers.

Mail

There are some differences between the mail commands in BSD and UNIX System V. If you are using the Compatibility Package's mail feature, you should also use all of its related programs (listed here) as well. You should not mix and match commands from the two versions of the mail feature.

biff

biff enables and disables immediate notification of the arrival of mail. Not in UNIX System V.

mailstats

Reports statistics gathered by sendmail, including number of messages received, number sent, and their size. Not in UNIX System V.
newaliases Rebuilds the aliases database in /usr/ucblib/aliases; called by sendmail, it’s run every time a message is sent. Not in UNIX System V.

sendmail The basic mail utility for which mail is a user-friendly “front-end.” sendmail has been modified for additional security. Not in UNIX System V.

vacation The vacation program sends a pre-written reply to anyone who sends you mail while you are gone.

NFS

fsirand Installs random inode generation numbers on all the inodes on a given device; also installs a filesystem ID in the superblock. This helps increase the security of filesystems exported by NFS. Not in UNIX System V.

UNIX System V Management

Because of limitations in underlying UNIX System V support, the commands in this section for stopping and starting your system cannot provide full BSD functionality. Nonetheless, they are included here for compatibility, so that existing shell scripts invoking them can still function. For example, the compatibility package versions of fastboot and fasthalt do not prevent disk checks. It is recommended that the user consult the Manual Pages for the following commands, to find out about specific limitations: fastboot, fasthalt, halt, reboot, and shutdown.

arch Displays your machine architecture. This works the same as `uname -m` but arch is not in UNIX System V.

fastboot Reboots your machine. (See the fastboot compatibility package Manual Page.) Not in UNIX System V.

fasthalt Halts your machine. (See the fasthalt compatibility package Manual Page.) Not in UNIX System V.
BSD Compatibility Package Commands

grpck          Checks that entries in the file /etc/groups are correct.

halt           Shuts down the system. halt syncs the disks and writes out any information before shutting down. Not in UNIX System V, however, similar functionality is found in shutdown or init 0. (See the compatibility package Manual Page for halt for any limitations on BSD functionality.)

hostid         Prints the numeric identifier (in hexadecimal) of the current host. Not in UNIX System V.

hostname       Displays the name of your machine. Also allows you to rename it. Not in UNIX System V but it works like uname(1).

install        Allows you to install (optional) software on your system. This version is very different from the UNIX System V one.

logger         Allows you to add entries to a system log. Priorities, tags, and files to write to may be specified.

mach           Reports the machine type.

mach's function has been merged into uname -p; however, because many scripts and makefiles use mach, it has been placed in the compatibility package. Not in UNIX System V.

mt and tcopy   mt sends commands to a magnetic tape; tcopy copies a magnetic tape.

Both rely on a set of ioctl's that are not present in default UNIX System V. However, users with new or enhanced device drivers may take advantage of this command. Not in UNIX System V.

pagesize       Reports the size of a page in bytes. Useful for scripts. Not in UNIX System V.

pwck           Similar to grpck, pwck checks to see that entries in your passwd file are correct.

reboot         Reboots your system. Although not in UNIX System V, this command behaves like shutdown or init 6. (See the compatibility package Manual Page for reboot for any limitations on BSD functionality.)
shutdown This version of shutdown allows you to specify a time and a warning message to be sent. It also sends shutdown messages to other systems if they have mounted filesystems from the machine being shut down. (See the compatibility package Manual Page for shutdown for any limitations on BSD functionality.)

uptime Shows how long the system has been up. Not in UNIX System V.

$ uptime
10:21pm up 49 mins, 1 user
$ UNIX System V’s who -b tells you when the system was last booted. BSD’s uptime tells you how long it’s been since the last boot. The two are equivalent.

Process Management

lastcomm Shows the last commands executed on the system. Also can be done by user or by terminal. Not in UNIX System V but acctcom is similar.

ps This version displays more information, in a different format, from that of UNIX System V. See the compatibility package ps Manual Page for details.

renice renice’s functionality is now present in the priocntl command; however, for BSD compatibility reasons, renice is included in the compatibility package. Not in UNIX System V.
User Information

groups Displays the groups to which a user belongs. Although the id command has been enhanced to perform this function, groups is included here for compatibility.

users A simple command that displays a short list of logged-in users. Not in UNIX System V. The UNIX System V equivalent is who -q.

w Much of w's functionality exists in the 4.0 version of whodo; however, for full functionality, it is included here. Not in UNIX System V.

whoami Displays your effective user ID; whoami works even if you have used su to change your current user ID. Not in UNIX System V, although this is equivalent to id.

Miscellaneous

printenv Reports environment variables as currently set. Similar to the env command. Not in UNIX System V.

stty The Release 4.0 version of stty incorporates many of the features of BSD stty. The compatibility package version is included for full BSD functionality.
BSD Library Routines

Compatibility library routines are placed in one of the following four libraries: libucb.a, libmp.a, libdbm.a, and libsocrpc.a. (The ones in librpcsoc.a are covered in the Transport Programming manual. See also Chapter overview.

The routines found in these libraries are divided into two groups. The first group are those commands that are not included in UNIX System V Release 4.0 but which are useful enough to merit retaining for backward compatibility. The second group contains those routines that have counterparts under UNIX System V Release 4.0 but have differences in the user interfaces for those routines.

Routines Not Included in UNIX System V Release 4.0

The following routines do not exist in UNIX System V Release 4.0, but are included in a compatibility libraries for backwards compatibility purposes. At some later date these routines will no longer be supported and will eventually be discarded.

Routines in libmp

libmp contains the following routines: gcd, itom, madd, mcmp, mdiv, mfree, min, mout, msqrt, msub, mtox, mult, pow, rpow, sdiv. These routines perform arithmetic on integers of arbitrary length. They are contained in /usr/ucblib/libmp.a. For more details, please refer to the appropriate Manual Pages.

Routines in libdbm

libdbm contains the following routines: dbmclose, dbminit, delete, fetch, firstkey, nextkey, store. These routines maintain key/content pairs in a database using database routines. They are packaged in /usr/ucb/libdbm.a. For more information, see the appropriate Manual Pages.
**Routines in libucb**

**alloca**
Allocates the given number of bytes in the stack frame of the caller, and returns a pointer to the allocated block.

**re_comp and re_exec**
Similar to the UNIX System V routines `regcmp` and `regex`. `re_comp` compiles the regular expression in a string, returning 0 if it compiled successfully or returning a pointer to an error message if it did not. `regcmp`, on the other hand, returns a pointer to the compiled form or NULL if given an incorrect argument. `re_exec` returns 1 if the string `s` matches the last compiled regular expression, 0 if it fails to match, and -1 if the regular expression is invalid. `regex`, however, returns NULL on failure or a pointer to the next unmatched character on success.

See the LIBGEN library for UNIX System V equivalents.

**ualarm and usleep**
Simplified interfaces to the system calls handling high-resolution timers.

**initstate, random, setstate, and srand**
Random number generator routines relied on by many user programs under BSD.

See `rand(3C)`, `srand(3C)`, and `drand(3C)` in the *Programmer's Reference Manual*.

**endusershell, getusershell, and setusershell**
Allow certain editing of the passwd file.

**Database Manipulation Routines**
The following routines maintain key/content pairs in a database using database routines that allow the maintaining of several databases at once:

```
dbm_clearerr, dbm_close, dbm_delete, dbm_error, dbm_fetch,
dbm_firstkey, dbm_nextkey, dbm_open, and dbm_store.
```

For more details, please refer to the appropriate manual reference.

**decimal_to_double, decimal_to_extended, and decimal_to_single**
Convert decimal (integer) numbers to the appropriate floating point format. For more details, please refer to the appropriate manual reference. Corresponding conversion routines may be found in `decconv(3C)` in UNIX System V.
single_to_decimal, double_to_decimal, and extended_to_decimal
Convert floating point numbers in the appropriate formats to integers, rounding if necessary. For more details, please refer to the appropriate manual reference. Corresponding conversion routines may be found in deconv(3C) in UNIX System V.

econvert, fconvert, gconvert, seconvert, sfconvert, and sgconvert
Used to convert ASCII representations of numbers to various formats of float point numbers. For more details, please refer to the appropriate manual reference.

ecvt(3C), fcvt(3C), and gcvt(3C) are UNIX System V’s closest equivalent’s.

ftime
Returns a structure that contains elements showing the elapsed time since the epoch (00:00:00, January 1st, 1970). See ctime(3C).

strcasecmp and strncasecmp
Equivalent to strcmp and strncmp with the exception that the case of the characters is irrelevant.

timezone
Gets the time zone given an offset from GMT. ctime(3C) has many timezone features that will help with this functionality.

alphasort and scandir
These routines combine the functionalities of readdir and qsort to process directory information. scandir reads a directory and builds an array of pointers to directory entries, returning the number of entries in the array and a pointer to the array through the parameter, namelist. namelist is a pointer to an arrangement of directory structure pointers. If the directory cannot be opened for reading or if malloc cannot allocate enough memory to hold all the data structures, scandir returns -1. alphasort is a routine that alphabetically sorts an array of pointers to directory entries (built by the routine, scandir).

bcmp, bcopy, and bzero
Functionally equivalent to the ANSI functions, memcmp, memcpy, and memset. bcopy copies bytes, handling overlapping strings correctly. bcmp compares bytes, returning zero if they are identical, non-zero otherwise. bzero zeros out bytes.
getwd
Similar to getcwd. getwd returns the pathname of the current working directory, or NULL if there is an error. The return value of getwd is placed in a character string allocated by the caller.

ieee_handler
This provides easy exception handling to exploit ANSI/IEEE Std 754-1985 arithmetic in a C program. Results arising from invalid arguments and invalid combinations are undefined for efficiency.

copysign, fp_class, isnan, and scalbn
These functions provide capabilities required by ANSI/IEEE Standard 754-1985, or suggested in its appendix.

copysign copies the sign bit from one double to another; fp_class corresponds to IEEE's class and classifies doubles as zero, subnormal, NaN, and so on; isnan returns 1 if its argument is not a number; and scalbn \((x, n)\) returns 
\[
x \times 2^{\ast n}
\]
computed by exponent manipulation rather than by actually performing an exponentiation or a multiplication.

fp_class and isnan are equivalent to isnan(3C) and scalbn works like frexp(3C).

mkstemp
Similar in function to mktemp(3C), but mkstemp returns the descriptor of the temporary file. mkstemp makes a unique filename and opens the file. Given a string that looks like a filename with six trailing Xs, mkstemp replaces the Xs with a letter and the current process ID. The letter is chosen so that the resulting name does not duplicate an existing file.

index and rindex
index returns a pointer to the first occurrence of a single character in a null-terminated character string. If the character does not occur in the string, index returns a NULL pointer. In UNIX System V, string(3C)'s strchr may be the appropriate replacement.
rindex returns a pointer to the last occurrence of a single character in a null-terminated string, or a NULL pointer if the letter does not occur in the string. In UNIX System V, string(3C)'s strrchr may be the appropriate replacement.

setbuffer and setlinebuf
These routines are used to provide control over the buffering used for input and output.

Similar to setbuf and setvbuf, setbuffer may be used after a stream has been opened but before it is read or written. It causes the array pointer to be used instead of an automatically allocated buffer. If the buffer is the NULL pointer, input/output is completely unbuffered.

setlinebuf is used to change the buffering on a stream from block buffered or unbuffered to line buffered. It can be used at any time that the file descriptor is active.

Routines Varying from UNIX System V Release 4.0

The following routines are located in libucb.a and differ slightly from UNIX System V:

fopen
UNIX System V and BSD versions differ in the handling of the a type. If mode a is specified, UNIX System V opens the file with O_APPEND set, while BSD doesn't. Also, BSD always seeks to the end of the file when mode a is specified, while UNIX System V seeks to the end of the file if update mode is not specified.

nice
BSD version always returns 0 if successful. The UNIX System V version returns the new nice value minus 20.

nlist
If unsuccessful, returns the number of symbols that were not located in the symbol table. (The UNIX System V version returns 0 if unsuccessful.) Also, nlist takes a filename as an argument, rather than a file descriptor.

rand
UNIX System V returns the generated number shifted to the right by 16 and anded with 0x7fff, while BSD returns the generated number anded with 0x7fffffff.
sleep  UNIX System V returns the "unslept" amount, that is, the requested time minus the time actually slept. The BSD version does not return anything.

times  BSD returns 0 when successful. UNIX System V returns the elapsed real time in clock ticks per second from an arbitrary point in the past.

printf, fprintf, sprintf, vfprintf, vprintf, and vsprintf

The following differences exist for these functions:

- In BSD, sprintf returns a pointer to its first argument; in UNIX System V, it returns the count of characters printed.
- In BSD, printf and vprintf always return the number of characters printed, while the UNIX System V version returns EOF in case of error.
- fprintf and vfprintf share the same differences as printf and vprintf (above); additionally, the buffering scheme for these routines is different for UNIX System V and BSD.
BSD System Calls and Signals

The following routines reside in libucb.a.

**BSD System Calls**

- **getdtablesize**: Gets the size of a process’s descriptor table. This function calls the UNIX System V system call getrlimit.
- **gethostid**: Returns the 32-bit identifier for the current host. This function calls UNIX System V’s syscall.
- **gethostname**: Returns the standard hostname for the current processor. Calls the UNIX System V system call syscall.
- **getrusage**: Gets information about system utilization. Calls UNIX System V’s times system call.
- **gettimeofday**: Get or set date and time. Calls the UNIX System V system call hrtctnl. Note that this version of gettimeofday accepts two arguments, although it doesn’t use the second one.
- **killpg**: Sends a signal to a process group. Calls kill, found in UNIX System V.
- **reboot**: Restart system or halt processor. Calls the UNIX System V system call uadmin.
- **setregid**: Set real and effective group ID’s. Calls UNIX System V’s setuid and seteuid system calls.
- **setreuid**: Set real and effective user ID’s. Calls UNIX System V’s setgid and setegid.
- **settimeofday**: Set date and time of day. Calls UNIX System V’s system call stime. Note that this function accepts two arguments, although it ignores the second.
- **syscall**: Performs indirect system calls. Calls the UNIX System V trap mechanism.
- **utimes**: Sets file times. Calls the UNIX System V system call utime.
wait3

Alternate system call (to wait) for waiting for a process to stop. This system call calls UNIX System V’s waitid system call.

**BSD Signals**

BSD signal handlers and default actions are different from UNIX System V’s.

The BSD style of signal handling is provided in the compatibility package. These routines invoke existing UNIX System V signal handling routines. These routines reside in libucb.a.

**longjmp, longjmp, _setjmp, and setjmp**

In BSD, _setjmp and longjmp save and restore the signal mask. This functionality has been preserved with the sigsetjmp and siglongjmp signals, respectively.

**psignal and psignal**

In BSD, _psignal doesn’t flush stdio buffers (neither does UNIX System V’s version of psignal). The compatibility package version of psignal, however, does.

**sigblock and sigsetmask**

In BSD, sigblock blocks a signal; sigsetmask sets a signal mask. The functionality of these two has been folded into sigprocmask in the compatibility package.

**siginterrupt, signal, sigvec and sigaction**

In BSD, siginterrupt is a library function that allows signal interruptions; signal is a library function for simplified signal processing. Both now call sigvec, which itself calls the new compatibility signal handler sigaction.

**sigpause**

Releases block signals; waits for interrupts. Implemented in the compatibility package through sigsuspend.
BSD Header Files

BSD Header Files Not Included in UNIX System V Release 4.0

Some BSD header files do not exist in UNIX System V Release 4.0. An attempt has been made to provide compatibility for header files, but in some cases it was impossible to achieve real source compatibility. The user should, wherever possible, be aware of the remaining differences.

**fp.h** Used by the econvert and decimal_to_string family of routines.

Note that this is equivalent to the floatingpoint.h header file. Generally, UNIX System V doesn't allow filenames of more than 14 characters; however, users who have installed the UFS file system may link fp.h to floatingpoint.h for compatibility.

**dbm.h** Used by routines in libdbm and user programs invoking libdbm

**ndbm.h** Used by ndbm routines and user programs invoking them.

**mp.h** Used by libmp routines and user programs invoking them.

**strings.h** Contains the same type of information as string.h.

**struct.h** Contains useful macros.

**sunfp.h** Used by the decimal_to_string family of routines.

Note that this is the same as the sunfloatingpoint.h header file. Generally, UNIX System V doesn't allow filenames of more than 14 characters; however, users who have installed the UFS file system may link sunfloatingpoint.h to sunfp.h for compatibility.

**sysexits.h** Contains useful exit codes.

**sys/ieeefp.h** Used by the econvert and decimal_to_string family of routines, included by floatingpoint.h.

**sys/mtio.h** Used by the mt and tcopy commands and the enhanced tape drivers.
sys/reboot.h
Used by the reboot system call wrapper in the Compatibility Package.

ufs/quota.h
Includes sys/fs.ufs_quota.h, and added for compatibility.

---

**BSD Header Files Varying from UNIX System V Release 4.0**

As with the library routines, there are some header files under UNIX System V Release 4.0 that differ slightly from their BSD counterparts. In those instances, the affected header files are included in this compatibility package with as many additions as possible to keep them compatible with BSD. The following list shows those files affected and the reasons for their inclusion in this package.

assert.h Included for compatibility.

regexp.h Includes ctype.h for compatibility.

unistd.h Includes #defines missing in the UNIX System V Release 4.0 version of this file.

setjmp.h Includes additional #defines and #includes for compatibility.

signal.h Contains sys/signal.h. Included here for compatibility.

stdio.h Includes BSD-specific definitions.

sys/dirent.h Includes the missing DIRSIZ macro used by many BSD utilities.

sys/fcntl.h Includes missing #defines.

sys/file.h Includes missing #defines such as L_SET, L_INCR.

sys/param.h Includes missing #defines.

sys/resource.h Includes the rusage structure missing from the UNIX System V Release 4.0 version of resource.h and used by the getrusage system call wrapper.
### BSD Header Files

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roffbib(l) ....................................................... format and print a bibliographic database
sccs(l) ....................................................... front end for the Source Code Control System (SCCS)
sobin(l) ............................................. resolve and eliminate .so requests from nroff or troff input
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NAME
addbib - create or extend a bibliographic database

SYNOPSIS
/usr/ucb/addbib [ -a ] [ -p promptfile ] database

DESCRIPTION
When addbib starts up, answering y to the initial Instructions? prompt yields directions; typing n or RETURN skips them. addbib then prompts for various bibliographic fields, reads responses from the terminal, and sends output records to database. A null response (RETURN) means to leave out that field. A ‘-’ (minus sign) means to go back to the previous field. A trailing backslash allows a field to be continued on the next line. The repeating Continue? prompt allows the user either to resume by typing y or RETURN, to quit the current session by typing n or q, or to edit database with any system editor (vi, ex, ed).

The following options are available:

- Suppress prompting for an abstract; asking for an abstract is the default. Abstracts are ended with a CTRL-D.
- Use a new prompting skeleton, defined in promptfile. This file should contain prompt strings, a TAB, and the key-letters to be written to the database.

USAGE
Bibliography Key Letters
The most common key-letters and their meanings are given below. addbib insulates you from these key-letters, since it gives you prompts in English, but if you edit the bibliography file later on, you will need to know this information.

%A Author’s name
%B Book containing article referenced
%C City (place of publication)
%D Date of publication
%E Editor of book containing article referenced
%F Footnote number or label (supplied by refer(l))
%G Government order number
%H Header commentary, printed before reference
%I Issuer (publisher)
%J Journal containing article
%K Keywords to use in locating reference
%L Label field used by -k option of refer(l)
%M Bell Labs Memorandum (undefined)
addbib(1)

%N  Number within volume
%O  Other commentary, printed at end of reference
%P  Page number(s)
%Q  Corporate or Foreign Author (unreversed)
%R  Report, paper, or thesis (unpublished)
%S  Series title
%T  Title of article or book
%V  Volume number
%X  Abstract — used by roffbib, not by refer
%Y, Z  Ignored by refer

SEE ALSO
indexbib(l), lookbib(l), refer(l), roffbib(l), sortbib(l),
NAME
apropos - locate commands by keyword lookup

SYNOPSIS
/usr/ucb/apropos keyword...

DESCRIPTION
apropos shows which manual sections contain instances of any of the given key-
words in their title. Each word is considered separately and the case of letters is
ignored. Words which are part of other words are considered; thus, when look­
ing for 'compile', apropos will find all instances of 'compiler' also.
Try
   apropos password
and
   apropos editor
If the line starts 'filename(section) ...' you can do 'man section filename' to get the
documentation for it. Try
   apropos format
and then
   man 3s printf
to get the manual page on the subroutine printf.
apropos is actually just the -k option to the man(1) command.

FILES
/usr/share/man/whatis data base

SEE ALSO
man(1), whatis(1), catman(1M).
NAME
arch – display the architecture of the current host

SYNOPSIS
/usr/ucb/arch

DESCRIPTION
The arch command displays the architecture of the current host system.

SEE ALSO
mach(1).
NAME
basename - display portions of pathnames

SYNOPSIS
/usr/ucb/basename string [ suffix ]

DESCRIPTION
basename deletes any prefix ending in '/' and the suffix, if present in string. It
directs the result to the standard output, and is normally used inside substitution
marks (' ') within shell procedures. The suffix is a pattern as defined on the
ed(1) manual page.

EXAMPLE
This shell procedure invoked with the argument /usr/src/bin/cat.c compiles
the named file and moves the output to cat in the current directory:

    cc $1
    mv a.out `basename $1 .c`

SEE ALSO
NAME

biff - give notice of incoming mail messages

SYNOPSIS

/usr/ucb/biff [ y | n ]

DESCRIPTION

biff turns mail notification on or off for the terminal session. With no arguments, biff displays the current notification status for the terminal.

The y option allows mail notification for the terminal. The n option disables notification for the terminal.

If notification is allowed, the terminal rings the bell and displays the header and the first few lines of each arriving mail message. biff operates asynchronously. For synchronized notices, use the MAIL variable of sh(1) or the mail variable of csh(1).

A 'biff y' command can be included in your ~/.login or ~/.profile file for execution when you log in.

FILES

~/.login
~/.profile

SEE ALSO

csh(1), mail(1), sh(1) in the User's Reference Manual.
NAME
cc - C compiler

SYNOPSIS
/usr/ucb/cc [ options ]

DESCRIPTION
/usr/ucb/cc is the C compiler for the BSD Compatibility Package. /usr/ucb/cc is identical to /usr/bin/cc (see cc(1)) except that BSD header files are used BSD libraries are linked before System V libraries.

/usr/ucb/cc accepts the same options as /usr/bin/cc, with the following exceptions:
- I "dir"
  Search dir for included files whose names do not begin with a '/', prior to the usual directories. The directories from multiple -I options are searched in the order specified. The preprocessor first searches for #include files in the directory containing sourcefile, and then in directories named with -I options (if any), then /usr/ucbinclude, and finally, in /usr/include.

- L "dir"
  Add dir to the list of directories searched for libraries by /usr/bin/cc. This option is passed to /usr/bin/ld. Directories specified with this option are searched before /usr/ucblib and /usr/lib.

- Y LU, dir
  Change the default directory used for finding libraries.

FILES
/usr/ucb/lib
/usr/lib /ld
/usr/ucb/lib/libucb.a
/usr/lib/libucb.a

NOTES
The -Y LU, dir option may have unexpected results, and should not be used. This option is not in the UNIX System V base.

SEE ALSO
ld(1).

NAME
checknr - check nroff and troff input files; report possible errors

SYNOPSIS
/usr/ucb/checknr [ -fs ] [ -a .x1 .y1 .x2 .y2 ... .x n .y n ] [ -c .x1 .x2 .x3 ... .x n ] [ filename ... ]

DESCRIPTION
The checknr command checks a list of nroff or troff input files for certain kinds of errors involving mismatched opening and closing delimiters and unknown commands. If no files are specified, checknr checks the standard input. Delimiters checked are:

- Font changes using \fx ... \fP.
- Size changes using \sx ... \sO.
- Macros that come in open ... close forms, for example, the .TS and .TE macros which must always come in pairs.

checknr knows about the ms and me macro packages.

checknr is intended to be used on documents that are prepared with checknr in mind. It expects a certain document writing style for \f and \s commands, in that each \fx must be terminated with \fP and each \sx must be terminated with \sO. While it will work to directly go into the next font or explicitly specify the original font or point size, and many existing documents actually do this, such a practice will produce complaints from checknr. Since it is probably better to use the \fP and \sO forms anyway, you should think of this as a contribution to your document preparation style.

The following options are available:
- -f Ignore \f font changes.
- -s Ignore \s size changes.
- -a .x1 .y1...
  Add pairs of macros to the list. The pairs of macros are assumed to be those (such as .BS and .DE) that should be checked for balance. The -a option must be followed by groups of six characters, each group defining a pair of macros. The six characters are a period, the first macro name, another period, and the second macro name. For example, to define a pair .BS and .ES, use -a.BS.ES
- -c .x1...
  Define commands which checknr would otherwise complain about as undefined.

SEE ALSO
eqn(1), nroff(1), troff(1), me(7), ms(7).

NOTES
There is no way to define a one-character macro name using the -a option.
NAME
chown - change file owner

SYNOPSIS
/usr/ucb/chown [-fhR] owner[.group] file ...

DESCRIPTION
chown changes the owner of the files to owner. The owner may be either a decimal user ID or a login name found in /etc/passwd file. The optional .group suffix may be used to change the group at the same time.

If chown is invoked by other than the super-user, the set-user-ID bit of the file mode, 04000, is cleared.

Only the super-user may change the owner of a file.

Valid options to chown are:

- Suppress error reporting
- If the file is a symbolic link, change the owner of the symbolic link. Without this option, the owner of the file referenced by the symbolic link is changed.
- Descend recursively through directories setting the ownership ID of all files in each directory entered.

FILES
/etc/group
/etc/passwd

NOTES
In a Remote File Sharing environment, you may not have the permissions that the output of the ls -1 command leads you to believe. For more information see the "Mapping Remote Users" section of the Remote File Sharing chapter of the System Administrator's Guide.

SEE ALSO
cgrgp(1), chmod(1)
NAME
deroff - remove nroff, troff, tbl and eqn constructs

SYNOPSIS
/usr/ucb/deroff [ -w ] filename ...

DESCRIPTION
The deroff command reads each file in sequence and removes all nroff and
troff command lines, backslash constructions, macro definitions, eqn constructs
(between .EQ and .EN lines or between delimiters), and table descriptions and
writes the remainder on the standard output. deroff follows chains of included
files (.so and .nx commands); if a file has already been included, a .so is
ignored and a .nx terminates execution. If no input file is given, deroff reads
from the standard input file.

OPTIONS
-w Generate a word list, one word per line. A ‘word’ is a string of letters,
digits, and apostrophes, beginning with a letter; apostrophes are removed.
All other characters are ignored.

SEE ALSO
eqn(1), nroff(1), tbl(1), troff(1)

NOTES
deroff is not a complete troff interpreter, so it can be confused by subtle con­
structs. Most errors result in too much rather than too little output.
deroff does not work well with files that use .so to source in the standard
macro package files.
**NAME**
df – report free disk space on file systems

**SYNOPSIS**
/usr/ucb/df [ -beglnTV ] [ directory | special ]

**DESCRIPTION**
df displays the amount of disk space occupied by currently mounted file systems, the amount of used and available space, and how much of the file system's total capacity has been used.

If arguments to df are path names, df produces a report on the file system containing the named file. Thus 'df .' shows the amount of space on the file system containing the current directory.

The following options are available:

- `-b` Print only the number of kilobytes free.
- `-e` Print only the number of file entries free.
- `-g` Print the entire statvfs structure. Not valid with any other option, except the `-l` option.
- `-l` Report on local file systems only.
- `-n` Print only the file system type name.
- `-t` Report figures for total allocated blocks and files as well as free blocks and files.
- `-v` Print allocations in kilobytes.
- `-v` Verbose. Echo complete command line.

**EXAMPLE**
A sample of output for df looks like:

```
    df
    Filesystem  kbytes  used  avail  capacity Mounted on
    sparky:/    7445    4714   1986     70%      /
    sparky:/usr 42277  35291  2758     93%   /usr
```

**FILES**
/etc/mnttab list of file systems currently mounted
/etc/vfstab list of default parameters for each file system

**SEE ALSO**
du(1M), quot(1M), tunefs(1M), mnttab(4) in the System Administrator's Reference Manual.
diffmk(1)

NAME
diffmk – mark differences between versions of a troff input file

SYNOPSIS
/usr/ucb/diffmk oldfile newfile markedfile

DESCRIPTION
The diffmk command compares two versions of a file and creates a third version
that includes “change mark” (.mc) commands for nroff and troff. oldfile and
newfile are the old and new versions of the file. diffmk generates markedfile,
which, contains the text from newfile with troff(1) “change mark” requests (.mc)
inserted where newfile differs from oldfile. When markedfile is formatted, changed
or inserted text is shown by a | at the right margin of each line. The position of
deleted text is shown by a single *.

diffmk can also be used in conjunction with the proper troff requests to pro­duce program listings with marked changes. In the following command line:

diffmk old.c new.c marked.c ; nroff reqs marked.c | pr
the file reqs contains the following troff requests:

.pl 1
.ll 77
.nf
.eo
.nh

which eliminate page breaks, adjust the line length, set no-fill mode, ignore
escape characters, and turn off hyphenation, respectively.

If the characters | and * are inappropriate, you might run markedfile through sed
to globally change them.

SEE ALSO
nroff(1), troff(1)

NOTES
Aesthetic considerations may dictate manual adjustment of some output. File
differences involving only formatting requests may produce undesirable output,
that is, replacing .sp by .sp 2 will produce a “change mark” on the preceding
or following line of output.
NAME
echo - echo arguments

SYNOPSIS
/usr/ucb/echo [ arg ]...
/usr/ucb/echo [ -n ] [ arg ]

DESCRIPTION
echo writes its arguments separated by blanks and terminated by a new-line on the standard output.

The /usr/bin/sh version understands the following C-like escape conventions; beware of conflicts with the shell’s use of \:

\b backspace
\c print line without new-line
\f form-feed
\n new-line
\r carriage return
\t tab
\v vertical tab
\\ backslash
\0n where n is the 8-bit character whose ASCII code is the 1-, 2- or 3-digit octal number representing that character.

The following option is available to /usr/bin/sh users only if /usr/ucb preceds /usr/bin in the user’s PATH. It is available to /usr/csh users, regardless of PATH:

-­n Do not add the newline to the output.

echo is useful for producing diagnostics in command files and for sending known data into a pipe.

SEE ALSO

NOTES
The -­n option is a transition aid for BSD applications, and may not be supported in future releases.

The When representing an 8-bit character by using the escape convention \0n, the n must always be preceded by the digit zero (0).

For example, typing: echo ‘WARNING:\07’ will print the phrase WARNING: and sound the “bell” on your terminal. The use of single (or double) quotes (or two backslashes) is required to protect the “\” that precedes the ”07”.

For the octal equivalents of each character, see ascii(5), in the System Administrator’s Reference Manual.
NAME
eqn, neqn, checkeq - typeset mathematics

SYNOPSIS
/usr/ucb/eqn [-dxy] [-fn] [-pn] [-sn] [filename] ...
/usr/ucb/neqn [filename] ...
/usr/ucb/checkeq [filename] ...

DESCRIPTION
The eqn and neqn commands are language processors to assist in describing
equations. eqn is a preprocessor for troff(1) and is intended for devices that can
print troff's output. neqn is a preprocessor for nroff(1) and is intended for use
with terminals.

checkeql reports missing or unbalanced delimiters and .EQ/.EN pairs.

If no filenames are specified, eqn and neqn read from the standard input. A line
beginning with .EQ marks the start of an equation; the end of an equation is
marked by a line beginning with .EN. Neither of these lines is altered, so they
may be defined in macro packages to get centering, numbering, etc. It is also
possible to set two characters as "delimiters"; subsequent text between delimiters
is also treated as eqn input.

The following options are available for eqn and neqn:

-dxy Set equation delimiters set to characters x and y with the command-line
argument. The more common way to do this is with delimxy between
.EQ and .EN. The left and right delimiters may be identical. Delimiters
are turned off by delim off appearing in the text. All text that is neither
between delimiters nor between .EQ and .EN is passed through
untouched.

-fn Change font to n globally in the document. The font can also be changed
globally in the body of the document by using the gfont directive.

-pn Reduce subscripts and superscripts by n point sizes from the previous
size. In the absence of the -p option, subscripts and superscripts are
reduced by 3 point sizes from the previous size.

-sn Set equations in point size n globally in the document. The point size can
also be changed globally in the body of the document by using the gsize
directive.

-Tdev Prepare output for device dev. If no -T option is present, eqn looks at the
environment variable TYPESETTER to see what the intended output device
is. If no such variable is found in the environment, a system-dependent
default device is assumed. Not available using neqn.

USAGE
eqn Language
Tokens within eqn are separated by braces, double quotes, tildes, circumflexes,
SPACE, TAB, or NEWLINE characters. Braces {} are used for grouping; generally
speaking, anywhere a single character like x could appear, a complicated con-
struction enclosed in braces may be used instead. Tilde (~) represents a full SPACE
in the output, circumflex (^) half as much.
Subscripts and superscripts are produced with the keywords sub and sup. Thus \( 'x \text{ sub } i' \) makes \( x_i \), \( 'a \text{ sub } i \text{ sup } 2' \) produces \( a_i^2 \), and \( 'e \text{ sup } (x \text{ sup } 2 + y \text{ sup } 2)' \) gives \( e^{x^2+y^2} \).

Fractions are made with over: \( 'a \text{ over } b' \) yields \( \frac{a}{b} \).

sqrt makes square roots: \( '1 \text{ over down } 10 \text{ sqrt } (ax \text{ sup } 2 + bx + c)' \) results in
\[
\frac{1}{\sqrt{ax^2 + bx + c}}.
\]

Although eqn tries to get most things at the right place on the paper, occasionally you will need to tune the output to make it just right. In the previous example, a local motion, down 10 was used to get more space between the square root and the line above it.

The keywords from and to introduce lower and upper limits on arbitrary things:
\[
\lim_{n \to \infty} \sum_{i=0}^{n} x_i
\]
is made with 'lim from \( \{n \to \inf \} \) sum from 0 to \( n \times \text{ sub } i'.'

Left and right brackets, braces, etc., of the right height are made with left and right: \( '\text{left } [ x \text{ sup } 2 + y \text{ sup } 2 \text{ over } \alpha \text{ right } ] \sim -1' \) produces
\[
\left[ \frac{x^2 + y^2}{\alpha} \right] = 1.
\]

The right clause is optional. Legal characters after left and right are braces, brackets, bars, c and f for ceiling and floor, and "" for nothing at all (useful for a right-side-only bracket).

Vertical piles of things are made with pile, lpile, cpile, and rpile: \( '\text{pile } (a \text{ above } b \text{ above } c)' \) produces \( b \). There can be an arbitrary number of elements in a pile. lpile left-justifies, pile and cpile center, with different vertical spacing, and rpile right-justifies.

Matrices are made with matrix: \( '\text{matrix } \{ \text{lcol } \{ x \text{ sub } i \text{ above } y \text{ sub } 2 \} \ \{ x_i \ \{ 1 \text{ above } 2 \} \text{ ccol } \} \}' \) produces \( \begin{matrix} x_1 \\ x_2 \end{matrix} \). In addition, there is rcol for a right-justified column.

Diacritical marks are made with dot, dotdot, hat, tilda, bar, vec, dyad, and under: \( 'x \text{ dot } = f(t) \text{ bar}' \) is \( \ddot{x} = \dot{f}(t) \), \( 'y \text{ dotdot bar } \sim - n \text{ under}' \) is \( \dddot{y} = n \), and \( 'x \text{ vec } \sim - y \text{ dyad}' \) is \( \vec{x} = \vec{y} \).

Sizes and font can be changed with size \( n \) or size \( \pm n \), roman, italic, bold, and font \( n \). Size and fonts can be changed globally in a document by gsize \( n \) and gfont \( n \), or by the command-line arguments -sn and -fn.

Successive display arguments can be lined up. Place mark before the desired lineup point in the first equation; place lineup at the place that is to line up vertically in subsequent equations.
Shorthands may be defined or existing keywords redefined with `define`:

```
define thing % replacement %
```

defines a new token called `thing` which will be replaced by `replacement` whenever it appears thereafter. The `%` may be any character that does not occur in `replacement`.

Keywords like `sum (\sum)`; `int (\int)`, `inf (\infty)`, and shorthands like `\geq (\geq)`, `\rightarrow (\rightarrow)`, and `\neq (\neq)` are recognized. Greek letters are spelled out in the desired case, as in `\alpha` or `\Gamma`. Mathematical words like `sin`, `cos`, and `log` are made Roman automatically. `\texttt{troff(1)}` four-character escapes like `\texttt{\textbackslash bu (\bullet)}` can be used anywhere. Strings enclosed in double quotes "..." are passed through untouched; this permits keywords to be entered as text, and can be used to communicate with `\texttt{troff}` when all else fails.

**EXAMPLE**

```bash
eqn filename ... | troff
neqn filename ... | nroff
```

**SEE ALSO**

`\texttt{tbl(1), troff(1), eqnchar(7), ms(7)}`

**NOTES**

To embolden digits, parens, etc., it is necessary to quote them, as in `\texttt{\textbf{12.3}}`.
NAME
   fsirand – install random inode generation numbers

SYNOPSIS
   /usr/ucb/fsirand [ -p ] special

DESCRIPTION
   fsirand installs random inode generation numbers on all the inodes on device
   special, and also installs a filesystem ID in the superblock. This helps increase the
   security of filesystems exported by NFS.

   fsirand must be used only on an unmounted filesystem that has been checked
   with fsck(1M). The only exception is that it can be used on the root filesystem
   in single-user mode, if the system is immediately re-booted afterwards.

   The -p option prints out the generation numbers for all the inodes, but does not
   change the generation numbers.

SEE ALSO
NAME

groups - display a user's group memberships

SYNOPSIS

/usr/ucb/groups [ user ... ]

DESCRIPTION

With no arguments, groups displays the groups to which you belong; else it
displays the groups to which the user belongs. Each user belongs to a group
specified in the password file /etc/passwd and possibly to other groups as
specified in the file /etc/group. If you do not own a file but belong to the
group which it is owned by then you are granted group access to the file.

FILES

/etc/passwd
/etc/group

SEE ALSO


NOTES

This command is obsolescent.
NAME
  hostid - print the numeric identifier of the current host

SYNOPSIS
  /usr/ucb/hostid

DESCRIPTION
  The hostid command prints the identifier of the current host in hexadecimal.
  This numeric value is likely to differ when hostid is run on a different machine.

SEE ALSO
  gethostid(2)
NAME
    hostname - set or print name of current host system

SYNOPSIS
    /usr/ucb/hostname [name-of-host]

DESCRIPTION
    The hostname command prints the name of the current host, as given before the
    login prompt. The super-user can set the hostname by giving an argument.

SEE ALSO
NAME

indxbib - create an inverted index to a bibliographic database

SYNOPSIS

/usr/ucb/indxbib database-file...

DESCRIPTION

indxbib makes an inverted index to the named database-file (which must reside within the current directory), typically for use by lookbib and refer. A database contains bibliographic references (or other kinds of information) separated by blank lines.

A bibliographic reference is a set of lines, constituting fields of bibliographic information. Each field starts on a line beginning with a ‘%’, followed by a key-letter, then a blank, and finally the contents of the field, which may continue until the next line starting with ‘%’ (see addbib).

indxbib is a shell script that calls two programs: mkey and inv. mkey truncates words to 6 characters, and maps upper case to lower case. It also discards words shorter than 3 characters, words among the 100 most common English words, and numbers (dates) < 1900 or > 2000. These parameters can be changed.

indxbib creates an entry file (with a .ia suffix), a posting file (.ib), and a tag file (.ic), in the working directory.

FILES

/usr/ucblib/reftools/mkey
/usr/ucblib/reftools/inv
*.*ia  entry file
*.*ib  posting file
*.*ic  tag file
*.*ig  reference file

SEE ALSO

addbib(1), lookbib(1), refer(1), roffbib(1), sortbib(1).

NOTES

All dates should probably be indexed, since many disciplines refer to literature written in the 1800s or earlier.

indxbib does not recognize pathnames.
NAME
install - install files

SYNOPSIS
/usr/ucb/install [ -cs ] [ -g group ] [ -m mode ] [ -o owner ] file1 file2
/usr/ucb/install [ -cs ] [ -g group ] [ -m mode ] [ -o owner ] file...directory
/usr/ucb/install -d [ -g group ] [ -m mode ] [ -o owner ] directory

DESCRIPTION
Install is used within makefiles to copy new versions of files into a destination
directory and to create the destination directory itself.

The first two forms are similar to the cp(1) command with the addition that executable files can be stripped during the copy and the owner, group, and mode of the installed file(s) can be given.

The third form can be used to create a destination directory with the required owner, group and permissions.

Note: install uses no special privileges to copy files from one place to another. The implications of this are:

• You must have permission to read the files to be installed.
• You must have permission to copy into the destination file or directory.
• You must have permission to change the modes on the final copy of the file if you want to use the -m option to change modes.
• You must be superuser if you want to specify the ownership of the installed file with -o. If you are not the super-user, or if -o is not in effect, the installed file will be owned by you, regardless of who owns the original.

OPTIONS
-g group Set the group ownership of the installed file or directory. (staff by default)
-m mode Set the mode for the installed file or directory. (0755 by default)
-o owner If run as root, set the ownership of the installed file to the user-ID of owner.
-c Copy files. In fact install always copies files, but the -c option is retained for backwards compatibility with old shell scripts that might otherwise break.
-s Strip executable files as they are copied.
-d Create a directory. Missing parent directories are created as required as in mkdir -p. If the directory already exists, the owner, group and mode will be set to the values given on the command line.

SEE ALSO
chown(1)
lastcomm(1)

NAME
lastcomm - show the last commands executed, in reverse order

SYNOPSIS
/usr/ucb/lastcomm [ command-name ] ... [ user-name ] ... [ terminal-name ] ...

DESCRIPTION
The lastcomm command gives information on previously executed commands. lastcomm with no arguments displays information about all the commands recorded during the current accounting file's lifetime. If called with arguments, lastcomm only displays accounting entries with a matching command-name, user-name, or terminal-name.

EXAMPLE
The command:

    lastcomm a.out root term/01

would produce a listing of all the executions of commands named a.out, by user root while using the terminal term/01. and

    lastcomm root

would produce a listing of all the commands executed by user root.

For each process entry, lastcomm displays the following items of information:

• The command name under which the process was called.
• One or more flags indicating special information about the process. The flags have the following meanings:
  F The process performed a fork but not an exec.
  S The process ran as a set-user-id program.
• The name of the user who ran the process.
• The terminal which the user was logged in on at the time (if applicable).
• The amount of CPU time used by the process (in seconds).
• The date and time the process exited.

FILES
/var/adm/pacct accounting file

SEE ALSO
sigvec(3)
NAME
   ld - link editor, dynamic link editor

SYNOPSIS
   /usr/ucb/ld [ options ]

DESCRIPTION
   /usr/ucb/ld is the link editor for the BSD Compatibility Package. /usr/ucb/ld
   is identical to /usr/bin/ld [see ld(1)] except that BSD libraries and routines are
   included before System V libraries and routines.

   /usr/ucb/ld accepts the same options as /usr/bin/ld, with the following
   exceptions:
   -L dir  Add dir to the list of directories searched for libraries by /usr/bin/ld.
           Directories specified with this option are searched before /usr/ucblib
           and /usr/lib.
   -Y LU,dir  Change the default directory used for finding libraries. Warning: this
              option may have unexpected results, and should not be used.

FILES
   /usr/ucblib
   /usr/lib
   /usr/ucblib/libx.a
   /usr/lib/libx.a

SEE ALSO
   ar(1), as(1), cc(1), ld(1), lorder(1), strip(1), tsort(1) in the Programmer's Refer-
   ence Manual.
NAME

ln – make hard or symbolic links to files

SYNOPSIS

/usr/ucb/ln [-fs] filename [ linkname ]
/usr/ucb/ln [-fs] pathname... directory

DESCRIPTION

/usr/ucb/ln creates an additional directory entry, called a link, to a file or directory. Any number of links can be assigned to a file. The number of links does not affect other file attributes such as size, protections, data, etc.

filename is the name of the original file or directory. linkname is the new name to associate with the file or filename. If linkname is omitted, the last component of filename is used as the name of the link.

If the last argument is the name of a directory, symbolic links are made in that directory for each pathname argument; /usr/ucb/ln uses the last component of each pathname as the name of each link in the named directory.

A hard link (the default) is a standard directory entry just like the one made when the file was created. Hard links can only be made to existing files. Hard links cannot be made across file systems (disk partitions, mounted file systems). To remove a file, all hard links to it must be removed, including the name by which it was first created; removing the last hard link releases the inode associated with the file.

A symbolic link, made with the -s option, is a special directory entry that points to another named file. Symbolic links can span file systems and point to directories. In fact, you can create a symbolic link that points to a file that is currently absent from the file system; removing the file that it points to does not affect or alter the symbolic link itself.

A symbolic link to a directory behaves differently than you might expect in certain cases. While an ls(1V) on such a link displays the files in the pointed-to directory, an 'ls -l' displays information about the link itself:

```
example% /usr/ucb/ln -s dir link
example% ls link
file1 file2 file3 file4
example% ls -l link
lrwxrwxrwx 1 user 7 Jan 11 23:27 link -> dir
```

When you cd(1) to a directory through a symbolic link, you wind up in the pointed-to location within the file system. This means that the parent of the new working directory is not the parent of the symbolic link, but rather, the parent of the pointed-to directory. For instance, in the following case the final working directory is /usr and not /home/user/linktest.

```
example% pwd
/home/user/linktest
example% /usr/ucb/ln -s /var/tmp symlink
example% cd symlink
example% cd ...
example% pwd
/usr
```
C shell user’s can avoid any resulting navigation problems by using the `pushd` and `popd` built-in commands instead of `cd`.

**OPTIONS**

- `-f` Force a hard link to a directory — this option is only available to the super-user.
- `-s` Create a symbolic link or links.

**EXAMPLE**

The commands below illustrate the effects of the different forms of the `/usr/ucb/ln` command:

```
example% /usr/ucb/ln file link
example% ls -F file link
file  link
example% /usr/ucb/ln -s file symlink
example% ls -F file symlink
file  symlink@
example% ls -li file link symlink
 10606 -rw-r--r-- 2 user 0 Jan 12 00:06 file
 10606 -rw-r--r-- 2 user 0 Jan 12 00:06 link
 10607 lrwxrwxrwx 1 user 4 Jan 12 00:06 symlink -> file
example% /usr/ucb/ln -s nonesuch devoid
example% ls -F devoid
devoid@
example% cat devoid
devoid: No such file or directory
example% /usr/ucb/ln -s /proto/bin/* /tmp/bin
example% ls -F /proto/bin /tmp/bin
/proto/bin:
x*  y*  z*  
/tmp/bin:
x@  y@  z@
```

**SEE ALSO**


**NOTES**

When the last argument is a directory, simple basenames should not be used for `pathname` arguments. If a basename is used, the resulting symbolic link points to itself:

```
example% /usr/ucb/ln -s file /tmp
example% ls -l /tmp/file
lrwxrwxrwx 1 user 4 Jan 12 00:16 /tmp/file -> file
example% cat /tmp/file
/tmp/file: Too many levels of symbolic links
```
To avoid this problem, use full pathnames, or prepend a reference to the \texttt{PWD} variable to files in the working directory:

\begin{verbatim}
example\% rm /tmp/file
example\% /usr/ucb/ln -s $PWD/file /tmp
lrwxrwxrwx 1 user 4 Jan 12 00:16 /tmp/file -> /home/user/subdir/file
\end{verbatim}
NAME
logger – add entries to the system log

SYNOPSIS
/usr/ucb/logger [-t tag] [-p priority] [-i] [-f filename] [message] ...

DESCRIPTION
logger provides a method for adding one-line entries to the system log file from
the command line. One or more message arguments can be given on the com­
mand line, in which case each is logged immediately. Otherwise, a filename can
be specified, in which case each line in the file is logged. If neither is specified,
logger reads and logs messages on a line-by-line basis from the standard input.

The following options are available:

-t tag Mark each line added to the log with the specified tag.
-p priority Enter the message with the specified priority. The message priority
can be specified numerically, or as a facility.level pair. For example,
'-'p local3.info' assigns the message priority to the info level in
the local3 facility. The default priority is user.notice.
-i Log the process ID of the logger process with each line.
-f filename Use the contents of filename as the message to log.
message If this is unspecified, either the file indicated with -f or the standard
input is added to the log.

EXAMPLE
logger System rebooted

will log the message 'System rebooted' to the facility at priority notice to be
treated by syslogd as other messages to the facility notice are.

logger -p local0.notice -t HOSTIDM -f /dev/idmc

will read from the file /dev/idmc and will log each line in that file as a message
with the tag 'HOSTIDM' at priority notice to be treated by syslogd as other mes­
sages to the facility local0 are.

SEE ALSO
syslog(3), syslogd(1M)
NAME
look - find words in the system dictionary or lines in a sorted list

SYNOPSIS
/usr/ucb/look [-d] [-f] [-tc] string [filename]

DESCRIPTION
The look command consults a sorted filename and prints all lines that begin with string.

If no filename is specified, look uses /usr/ucb/lib/dict/words with collating sequence -df.

The following options are available:
- d  Dictionary order. Only letters, digits, TAB and SPACE characters are used in comparisons.
- f  Fold case. Upper case letters are not distinguished from lower case in comparisons.
- tc Set termination character. All characters to the right of c in string are ignored.

FILES
/usr/ucb/lib/dict/words

SEE ALSO
NAME

lookbib - find references in a bibliographic database

SYNOPSIS

/usr/ucb/lookbib database

DESCRIPTION

A bibliographic reference is a set of lines, constituting fields of bibliographic information. Each field starts on a line beginning with a '%', followed by a key-letter, then a blank, and finally the contents of the field, which may continue until the next line starting with '%'. See addbib.

lookbib uses an inverted index made by indxbib to find sets of bibliographic references. It reads keywords typed after the '>' prompt on the terminal, and retrieves records containing all these keywords. If nothing matches, nothing is returned except another '>' prompt.

It is possible to search multiple databases, as long as they have a common index made by indxbib. In that case, only the first argument given to indxbib is specified to lookbib.

If lookbib does not find the index files (the .i[abc] files), it looks for a reference file with the same name as the argument, without the suffixes. It creates a file with a .ig suffix, suitable for use with fgrep (see grep). lookbib then uses this fgrep file to find references. This method is simpler to use, but the .ig file is slower to use than the .i[abc] files, and does not allow the use of multiple reference files.

FILES

*.ia
*.ib
*.ic
*.ig

index files
reference file

SEE ALSO

addbib(1), indxbib(1), refer(1), roffbib(1), sortbib(1).


NOTES

Probably all dates should be indexed, since many disciplines refer to literature written in the 1800s or earlier.
NAME
lpq - display the queue of printer jobs

SYNOPSIS
/usr/ucb/lpq [-P printer] [-l] [+ [ interval ] [ job# ... ] [ username ... ]]

DESCRIPTION
lpq displays the contents of a printer queue. It reports the status of jobs specified by job#, or all jobs owned by the user specified by username. lpq reports on all jobs in the default printer queue when invoked with no arguments.

For each print job in the queue, lpq reports the user's name, current position, the names of input files comprising the job, the job number (by which it is referred to when using lprm(1)) and the total size in bytes. Normally, only as much information as will fit on one line is displayed. Jobs are normally queued on a first-in-first-out basis. Filenames comprising a job may be unavailable, such as when lpr is used at the end of a pipeline; in such cases the filename field indicates the standard input.

If lpq warns that there is no daemon present (that is, due to some malfunction), the lpc(1M) command can be used to restart a printer daemon.

OPTIONS
-P printer Display information about the queue for the specified printer. In the absence of the -P option, the queue to the printer specified by the PRINTER variable in the environment is used. If the PRINTER variable is not set, the queue for the default printer is used.

-l Display queue information in long format; includes the name of the host from which the job originated.

+interval Display the spool queue periodically until it empties. This option clears the terminal screen before reporting on the queue. If an interval is supplied, lpq sleeps that number of seconds in between reports.

FILES
/var/spool/lp spooling directory.
/var/spool/lp/tmp/system_name/*-0 request files specifying jobs

DIAGNOSTICS
printer is printing
The lpq program queries the spooler LPSCHED about the status of the printer. If the printer is disabled, the superuser can restart the spooler using lpc(1M).

printer waiting for auto-retry (offline ?)
The daemon could not open the printer device. The printer may be turned off-line. This message can also occur if a printer is out of paper, the paper is jammed, and so on. Another possible cause is that a process, such as an output filter, has exclusive use of the device. The only recourse in this case is to kill the offending process and restart the printer with lpc.
waiting for host to come up
A daemon is trying to connect to the remote machine named *host*, in order to send the files in the local queue. If the remote machine is up, *lpd* on the remote machine is probably dead or hung and should be restarted using *lpc*.

sending to *host*
The files are being transferred to the remote *host*, or else the local daemon has hung while trying to transfer the files.

printer disabled reason:
The printer has been marked as being unavailable with *lpc*.

*lpq*: The LP print service isn’t running or can’t be reached.
The *lpsched* process overseeing the spooling queue does not exist. This normally occurs only when the daemon has unexpectedly died. You can restart the printer daemon with *lpc*.

*lpr*: printer: unknown printer
The printer was not found in the System V LP database. Usually this is a typing mistake; however, it may indicate that the printer does not exist on the system. Use ‘lptstat -p’ to find the reason.

*lpr*: error on opening queue to spooler
The connection to *lpsched* on the local machine failed. This usually means the printer server started at boot time has died or is hung. Check if the printer spooler daemon /usr/lib/lpsched is running.

*lpr*: Can’t send message to LP print service
*lpr*: Can’t receive message from LP print service
These indicate that the LP print service has been stopped. Get help from the system administrator.

*lpr*: Received unexpected message from LP print service
It is likely there is an error in this software. Get help from system administrator.

SEE ALSO
lp(1M), lpr(1), lprm(1),

NOTES
Output formatting is sensitive to the line length of the terminal; this can result in widely-spaced columns.
NAME
lpr - send a job to the printer

SYNOPSIS
/usr/ucb/lpr [ -P printer ] [ -# copies ] [ -C class ] [ -J job ] [ -T title ]
[ -i [ indent ] ] [ -w cols ] [ -B ] [ -r ] [ -m ] [ -h ] [ -s ]
[ -filter_option ] [ filename ... ]

DESCRIPTION
lpr forwards printer jobs to a spooling area for subsequent printing as facilities become available. Each printer job consists of copies of, or, with -s , complete pathnames of each filename you specify. The spool area is managed by the line printer spooler, lpsched. lpr reads from the standard input if no files are specified.

OPTIONS
-P printer send output to the named printer. Otherwise send output to the printer named in the PRINTER environment variable, or to the default printer, lp.
-# copies produce the number of copies indicated for each named file. For example:
    lpr -#3 index.c lookup.c
produces three copies of index.c, followed by three copies of lookup.c. On the other hand,
    cat index.c lookup.c | lpr -#3
generates three copies of the concatenation of the files.
-C class print class as the job classification on the burst page. For example,
    lpr -C Operations new.index.c
replaces the system name (the name returned by hostname) with Operations on the burst page, and prints the file new.index.c.
-J job print job as the job name on the burst page. Normally, lpr uses the first file's name.
-T title use title instead of the file name for the title used by pr(1).
-i[indent] indent output indent SPACE characters. Eight SPACE characters is the default.
-w cols use cols as the page width for pr.
-r remove the file upon completion of spooling, or upon completion of printing with the -s option. This is not supported in the SunOS compatibility package. However if the job is submitted to a remote SunOS system, these options will be sent to the remote system for processing.
-m Send mail upon completion.
-h Suppress printing the burst page.
-s Use the full pathnames (not symbolic links) of the files to be printed rather than trying to copy them. This means the data files should not be modified or removed until they have been printed. -s only prevents copies of local files from being made. Jobs from remote hosts are copied anyway. -s only works with named data files; if the lpr command is at the end of a pipeline, the data is copied to the spool.

filter_option

The following single letter options notify the line printer spooler that the files are not standard text files. The spooling daemon will use the appropriate filters to print the data accordingly.

-p Use pr to format the files (lpr -p is very much like pr | lpr).
-l Print control characters and suppress page breaks.
-t The files contain troff(1) (cat phototypesetter) binary data.
-n The files contain data from ditroff (device independent troff).
-d The files contain data from tex (DVI format from Stanford).
-g The files contain standard plot data as produced by the plot(3X) routines (see also plot(lG) for the filters used by the printer spooler).
-v The files contain a raster image. The printer must support an appropriate imaging model such as PostScript® in order to print the image.
-c The files contain data produced by cifplot.
-f Interpret the first character of each line as a standard FORTRAN carriage control character.

If no filter_option is given (and the printer can interpret PostScript), the string ‘%!’ as the first two characters of a file indicates that it contains PostScript commands.

These filter options offer a standard user interface, and all options may not be available for, nor applicable to, all printers.

FILES

/etc/passwd personal identification
/usr/lib/lp/lpsched System V line printer spooler
/var/spool/lp/tmp/* directories used for spooling
/var/spool/lp/tmp/system/*-0 spooler control files
/var/spool/lp/tmp/system/*-N (N is an integer and > 0) data files specified in ‘*-0’ files
DIAGNOSTICS

lpr: printer: unknown printer
The printer was not found in the LP database. Usually this is a typing mistake; however, it may indicate that the printer does not exist on the system. Use ‘lptstat -p’ to find the reason.

lpr: error on opening queue to spooler
The connection to lpsched on the local machine failed. This usually means the printer server started at boot time has died or is hung. Check if the printer spooler daemon /usr/lib/lpsched is running.

lpr: printer queue is disabled
This means the queue was turned off with

/usr/etc/lpc disable printer

to prevent lpr from putting files in the queue. This is normally done by the system manager when a printer is going to be down for a long time. The printer can be turned back on by a privileged user with lpc.

lpr: Can't send message to the LP print service

lpr: Can't receive message from the LP print service
These indicate that the LP print service has been stopped. Get help from the system administrator.

lpr: Received unexpected message from LP print service
It is likely there is an error in this software. Get help from system administrator.

lpr: There is no filter to convert the file content
Use the ‘lpstat -p -l’ command to find a printer that can handle the file type directly, or consult with your system administrator.

lpr: cannot access the file
Make sure file names are valid.

SEE ALSO
lpc(8), lpq(1), lprm(1), plot(1G), troff(1)

NOTES
lp is the preferred interface.
Command-line options cannot be combined into a single argument as with some other commands. The command:

lpr -fs

is not equivalent to

lpr -f -s
Placing the \texttt{-s} flag first, or writing each option as a separate argument, makes a link as expected.

\texttt{lpr -p} is not precisely equivalent to \texttt{pr | lpr}. \texttt{lpr -p} puts the current date at the top of each page, rather than the date last modified.

Fonts for \texttt{troff(1)} and \TeX reside on the printer host. It is currently not possible to use local font libraries.

\texttt{lpr} objects to printing binary files.

The \texttt{-s} option, intended to use symbolic links in SunOS, does not use symbolic links in the compatibility package. Instead, the complete path names are used. Also, the copying is avoided only for print jobs that are run from the printer host itself. Jobs added to the queue from a remote host are always copied into the spool area. That is, if the printer does not reside on the host that \texttt{lpr} is run from, the spooling system makes a copy the file to print, and places it in the spool area of the printer host, regardless of \texttt{-s}. 
NAME
lp:rm - remove jobs from the printer queue

SYNOPSIS
/usr/ucb/lp:rm [-Pprinter] [-] [job # ...] [username ...]

DESCRIPTION
lp:rm removes a job or jobs from a printer's spooling queue. Since the spool
directory is protected from users, using lp:rm is normally the only method by
which a user can remove a job.

Without any arguments, lp:rm deletes the job that is currently active, provided
that the user who invoked lp:rm owns that job.

When the privileged user specifies a username, lp:rm removes all jobs belonging to
that user.

You can remove a specific job by supplying its job number as an argument, which
you can obtain using lpq(1). For example:

```
lpq -Phost
host is ready and printing
Rank  Owner  Job  Files  Total Size
active  wendy  385  standard input 35501 bytes
lp:rm -Phost 385
```

lp:rm reports the names of any files it removes, and is silent if there are no appli-
cable jobs to remove.

lp:rm Sends the request to cancel a job to the print spooler, LPSCHED.

OPTIONS
- Pprinter Specify the queue associated with a specific printer. Otherwise the
  value of the PRINTER variable in the environment is used. If this vari-
  able is unset, the queue for the default printer is used.

- Remove all jobs owned by you. If invoked by the privileged user, all
  jobs in the spool are removed. Job ownership is determined by the
  user's login name and host name on the machine where the lpr com-
  mand was executed.

FILES
/var/spool/lp/* spooling directories

SEE ALSO
lpq(1), lpr(1)

DIAGNOSTICS
lp:rm: printer: unknown printer
The printer was not found in the System V LP database. Usually this is
a typing mistake; however, it may indicate that the printer does not exist
on the system. Use 'lptstat -p' to find the reason.
lprm: error on opening queue to spooler
   The connection to lpsched on the local machine failed. This usually means the printer server started at boot time has died or is hung. Check if the printer spooler daemon /usr/lib/lpsched is running.

lprm: Can't send message to the LP print service

lprm: Can't receive message from the LP print service
   These indicate that the LP print service has been stopped. Get help from the system administrator.

lprm: Received unexpected message from the LP print service
   It is likely there is an error in this software. Get help from system administrator.

lprm: Can't cancel request
   You are not allowed to remove another's request.

NOTES
An active job may be incorrectly identified for removal by an lprm command issued with no arguments. During the interval between an lpq(1) command and the execution of lprm, the next job in queue may have become active; that job may be removed unintentionally if it is owned by you. To avoid this, supply lprm with the job number to remove when a critical job that you own is next in line.

Only the privileged user can remove print jobs submitted from another host.
lp is the preferred interface.
NAME
lptest - generate lineprinter ripple pattern

SYNOPSIS
/usr/ucb/lptest [ length [ count ] ]

DESCRIPTION
lptest writes the traditional "ripple test" pattern on standard output. In 96
lines, this pattern will print all 96 printable ASCII characters in each position.
While originally created to test printers, it is quite useful for testing terminals,
driving terminal ports for debugging purposes, or any other task where a quick
supply of random data is needed.

The length argument specifies the output line length if the the default length of 79
is inappropriate.

The count argument specifies the number of output lines to be generated if the
default count of 200 is inappropriate.

NOTES
if count is to be specified, length must be also be specified.
This command is obsolescent.
NAME
ls - list the contents of a directory

SYNOPSIS
/usr/ucb/ls [-AaCcDdfgIlLqrRstul] filename ...

DESCRIPTION
For each filename which is a directory, ls lists the contents of the directory; for each filename which is a file, ls repeats its name and any other information requested. By default, the output is sorted alphabetically. When no argument is given, the current directory is listed. When several arguments are given, the arguments are first sorted appropriately, but file arguments are processed before directories and their contents.

Permissions Field
The mode printed under the -l option contains 10 characters interpreted as follows. If the first character is:

- d entry is a directory;
- b entry is a block-type special file;
- c entry is a character-type special file;
- l entry is a symbolic link;
- p entry is a FIFO (also known as named pipe) special file;
- s entry is an AF_UNIX address family socket, or
- - entry is a plain file.

The next 9 characters are interpreted as three sets of three bits each. The first set refers to owner permissions; the next refers to permissions to others in the same user-group; and the last refers to all others. Within each set the three characters indicate permission respectively to read, to write, or to execute the file as a program. For a directory, execute permission is interpreted to mean permission to search the directory. The permissions are indicated as follows:

- r the file is readable;
- w the file is writable;
- x the file is executable;
- - the indicated permission is not granted.

The group-execute permission character is given as s if the file has the set-group-id bit set; likewise the owner-execute permission character is given as s if the file has the set-user-id bit set.

The last character of the mode (normally x or '-') is true if the 1000 bit of the mode is on. See chmod(1) for the meaning of this mode. The indications of set-ID and 1000 bits of the mode are capitalized (S and T respectively) if the corresponding execute permission is not set.

When the sizes of the files in a directory are listed, a total count of blocks, including indirect blocks is printed. The following options are available:

- -a List all entries; in the absence of this option, entries whose names begin with a '.' are not listed (except for the privileged user, for whom ls normally prints even files that begin with a '.'.).
-A  Same as -a, except that '.' and '..' are not listed.
-c  Use time of last edit (or last mode change) for sorting or printing.
-C  Force multi-column output, with entries sorted down the columns; for ls, this is the default when output is to a terminal.
-d  If argument is a directory, list only its name (not its contents); often used with -1 to get the status of a directory.
-f  Force each argument to be interpreted as a directory and list the name found in each slot. This option turns off -l, -t, -s, and -r, and turns on -a; the order is the order in which entries appear in the directory.
-F  Mark directories with a trailing slash ('/'), executable files with a trailing asterisk ('*'), symbolic links with a trailing at-sign ('@'), and AF_UNIX address family sockets with a trailing equals sign ('=').
-g  For ls, show the group ownership of the file in a long output.
-i  For each file, print the i-node number in the first column of the report.
-1  List in long format, giving mode, number of links, owner, size in bytes, and time of last modification for each file. If the file is a special file the size field will instead contain the major and minor device numbers. If the time of last modification is greater than six months ago, it is shown in the format 'month date year'; files modified within six months show 'month date time'. If the file is a symbolic link the pathname of the linked-to file is printed preceded by '->'.
-L  If argument is a symbolic link, list the file or directory the link references rather than the link itself.
-q  Display non-graphic characters in filenames as the character ?; for ls, this is the default when output is to a terminal.
-r  Reverse the order of sort to get reverse alphabetic or oldest first as appropriate.
-R  Recursively list subdirectories encountered.
-s  Give size of each file, including any indirect blocks used to map the file, in kilobytes.
-t  Sort by time modified (latest first) instead of by name.
-u  Use time of last access instead of last modification for sorting (with the -t option) and/or printing (with the -l option).
-1  Force one entry per line output format; this is the default when output is not to a terminal.
FILE

/etc/passwd to get user ID's for 'ls -l' and 'ls -o'.
/etc/group to get group ID for 'ls -g'.

NOTES

NEWLINE and TAB are considered printing characters in filenames.
The output device is assumed to be 80 columns wide.
The option setting based on whether the output is a teletype is undesirable as 'ls -s' is much different than 'ls -s | lpr'. On the other hand, not doing this setting would make old shell scripts which used ls almost certain losers.

Unprintable characters in file names may confuse the columnar output options.
NAME

mach - display the processor type of the current host

SYNOPSIS

/usr/ucb/mach

DESCRIPTION

The mach command displays the processor-type of the current host.

SEE ALSO

arch(1).

**SYNOPSIS**

```bash
```

```
/usr/ucb/man [-M path] -k keyword ...
```

```
/usr/ucb/man [-M path] -f filename ...
```

**DESCRIPTION**

The `man` command displays information from the reference manuals. It can display complete manual pages that you select by `title`, or one-line summaries selected either by `keyword` (`-k`), or by the name of an associated file (`-f`).

A `section`, when given, applies to the `titles` that follow it on the command line (up to the next `section`, if any). `man` looks in the indicated section of the manual for those `titles`. `section` is either a digit (perhaps followed by a single letter indicating the type of manual page), or one of the words `new`, `local`, `old`, or `public`. If `section` is omitted, `man` searches all reference sections (giving preference to commands over functions) and prints the first manual page it finds. If no manual page is located, `man` prints an error message.

The reference page sources are typically located in the `/usr/share/man/man?` directories. Since these directories are optionally installed, they may not reside on your host; you may have to mount `/usr/share/man` from a host on which they do reside. If there are preformatted, up-to-date versions in corresponding `cat?` or `fmt?` directories, `man` simply displays or prints those versions. If the preformatted version of interest is out of date or missing, `man` reformats it prior to display. If directories for the preformatted versions are not provided, `man` reformats a page whenever it is requested; it uses a temporary file to store the formatted text during display.

If the standard output is not a terminal, or if the `-` flag is given, `man` pipes its output through `cat`. Otherwise, `man` pipes its output through `more` to handle paging and underlining on the screen.

The following options are available:

- `-t` `man` arranges for the specified manual pages to be `troffed` to a suitable raster output device (see `troff` or `vtroff`). If both the `-` and `-t` flags are given, `man` updates the `troffed` versions of each named `title` (if necessary), but does not display them.

- `-M path`
  Change the search path for manual pages. `path` is a colon-separated list of directories that contain manual page directory subtrees. When used with the `-k` or `-f` options, the `-M` option must appear first. Each directory in the `path` is assumed to contain subdirectories of the form `man[1-81-p]`.

- `-T macro-package`
  `man` uses `macro-package` rather than the standard `-man` macros defined in `/usr/ucb/lib/doctools/tmac/tmac.an` for formatting manual pages.
man prints out one-line summaries from the whatis database (table of contents) that contain any of the given keywords.

man attempts to locate manual pages related to any of the given filenames. It strips the leading pathname components from each filename, and then prints one-line summaries containing the resulting basename or names.

MANUAL PAGES
Manual pages are troff or nroff source files prepared with the -man macro package.

When formatting a manual page, man examines the first line to determine whether it requires special processing.

Preprocessing Manual Pages
If the first line is a string of the form:

```
" X
```

where X is separated from the the ‘”’ by a single SPACE and consists of any combination of characters in the following list, man pipes its input to troff or nroff through the corresponding preprocessors.

- e  eqn, or neqn for nroff
- r  refer
- t  tbl, and col for nroff

If eqn or neqn is invoked, it will automatically read the file /usr/ucblib/pub/eqnchar [see eqnchar(7)].

ENVIRONMENT

\-M\  if set, its value overrides /usr/share/man as the default search path. The -M flag, in turn, overrides this value.
\-P\  A program to use for interactively delivering man’s output to the screen. If not set, ‘more -s’ (see more) is used.
\-T\  The name of the program to use to display troffed manual pages. If not set, ‘lp -Ttroff’ (see lp) is used.
\-T\  The name of the formatter to use when the -t flag is given. If not set, troff is used.

FILES

- /usr/share/man root of the standard manual page directory subtree
- /usr/share/man/man?/* unformatted manual entries
- /usr/share/man/cat?/* nroffed manual entries
- /usr/share/man/fmt?/* troffed manual entries
- /usr/share/man/whatis table of contents and keyword database
- /usr/ucblib/doctools/tmac/man.macs standard -man macro package
- /usr/ucblib/pub/eqnchar
SEE ALSO

apropos(1), cat(1), catman(1M), col(1), eqn(1), nroff(1), refer(1), tbl(1),
troff(1), whatis(1), eqnchar(7).


NOTES

The manual is supposed to be reproducible either on a phototypesetter or on an
ASCII terminal. However, on a terminal some information (indicated by font
changes, for instance) is necessarily lost.

Some dumb terminals cannot process the vertical motions produced by the e
(eqn(1)) preprocessing flag. To prevent garbled output on these terminals, when
you use e also use t, to invoke col(1) implicitly. This workaround has the disad-
vantage of eliminating superscripts and subscripts — even on those terminals that
can display them. CTRL-Q will clear a terminal that gets confused by eqn(1) out-
put.
NAME

mt - magnetic tape control

SYNOPSIS

/usr/ucb/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. tapename must refer to a raw (not block) tape device. By default, mt performs the requested operation once; multiple operations may be performed by specifying count.

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

mt returns a 0 exit status when the operation(s) were successful, 1 if the command was unrecognized or if mt was unable to open the specified tape drive, and 2 if an operation failed.

the following commands are available to mt:

eof, weof Write count EOF 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.

asf Absolute space to count file number. This is equivalent to a rewind followed by a fsf count.

For the following commands, count is ignored:

eom Space to the end of recorded media on the tape (SCSI only). This is useful for appending files onto previously written tapes.

rewind Rewind the tape.

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

status Print status information about the tape unit.

retension Wind the tape to the end of the reel and then rewind it, smoothing out the tape tension.

erase Erase the entire tape.

FILES

/dev/rmt* raw magnetic tape interface
/dev/rar* raw Archive cartridge tape interface
/dev/rst* raw SCSI tape interface
/dev/rmt* raw Xylogics® tape interface
SEE ALSO

NOTES
Not all devices support all options. For example, ar currently does not support the fsr, bsf, or bsr options. The half-inch tape driver, /dev/rmt*, does not support the retension option.
nroff(1)

NAME
nroff - format documents for display or line-printer

SYNOPSIS
/usr/ucb/nroff [ -ehiqz ] [ -Fdir ] [ -mname ] [ -nN ] [ -opagelist ] [ -raN ]
[ -sN ] [ -Tname ] [ -uN ] [ filename ... ]

DESCRIPTION
nroff formats text in the named filename for typewriter-like devices. See also troff.

If no filename argument is present, nroff reads the standard input. An argument consisting of a ' - ' is taken to be a file name corresponding to the standard input.

The following options may appear in any order, but must appear before the files.

- e Produce equally-spaced words in adjusted lines, using full terminal resolution.

- h Use output TAB characters during horizontal spacing to speed output and reduce output character count. TAB settings are assumed to be every 8 nominal character widths.

- i Read the standard input after the input files are exhausted.

- q Invoke the simultaneous input-output mode of the rd request.

- Fdir Search directory dir for font tables instead of the system-dependent -mname default.

- mname Prepend the macro file /usr/share/lib/tmac/tmac.name to the input files.

- nN Number first generated page N.

- opagelist Print only pages whose page numbers appear in the comma-separated list of numbers and ranges. A range N- M means pages N through M; an initial - N means from the beginning to page N; and a final N- means from N to the end.

- raN Set register a (one-character) to N.

- sN Stop every N pages. nroff will halt prior to every N pages (default N=1) to allow paper loading or changing, and will resume upon receipt of a NEWLINE.

- Tname Prepare output for a device of the specified name. Known names are:

  37 Teletype Corporation Model 37 terminal — this is the default.
  crt | lpr | tn300 GE TermiNet 300, or any line printer or terminal without half-line capability.
  300 DASI-300.
300-12 DASI-300 — 12-pitch.
300S | 302 | dtc
    DASI-300S.
300S-12 | 302-12 | dtc12
    DASI-300S.
382    DASI-382 (fancy DTC 382).
382-12 DASI-382 (fancy DTC 382 — 12-pitch).
450    ipsi
    DASI-450 (Diablo Hyterm).
450-12 | ipsi12
    DASI-450 (Diablo Hyterm) — 12-pitch.
450-12-8 DASI-450 (Diablo Hyterm) — 12-pitch and 8 lines-per-inch.
450X    DASI-450X (Diablo Hyterm).
832     AJ 832.
833     AJ 833.
832-12  AJ 832 — 12-pitch.
833-12  AJ 833 — 12-pitch.
espon   Epson FX80.
itech   C:ITOH Prowriter.
itech-12 C:ITOH Prowriter — 12-pitch.
 nec    NEC 5570s0 or NEC 7770s0 Spinwriter.
nec12   NEC 5570 or NEC 7770 Spinwriter — 12-pitch.
nec-t   NEC 5570/7770 Spinwriter — Tech-Math/Times-Roman thim-ble.
 qume   Qume Sprint — 5 or9.
 qume12 Qume Sprint — 5 or 9,12-pitch.
xerox   Xerox 1770 or Diablo 1670.
xerox12 Xerox 1770 or Diablo 1670 — 12-pitch.
x-ecs   Xerox/Diablo 1730/630 — Extended Character Set.
x-ecsl2 Xerox/Diablo 1730/630 — Extended Character Set, 12-pitch.

-uN Set emboldening factor for the font mounted on position 3 to N. Emboldening is accomplished by overstriking the specified number of times.

-z Suppress formatted output. The only output will consist of diagnostic messages from nroff and messages output with the .tm request.

EXAMPLE
The following command:

    nroff -s4 -me users.guide

formats users.guide using the -me macro package, and stopping every 4 pages.

FILES
/tmp/ta* temporary file
/usr/ucblib/doctools/tmac/tmac.* standard macro files
/usr/ucblib/doctools/term/* terminal driving tables for nroff
/usr/ucblib/doctools/term/README index to terminal description files
SEE ALSO
    checknr(1), eqn(1), tbl(1), troff(1), man(7), me(7), ms(7).
NAME
pagesize - display the size of a page of memory

SYNOPSIS
/usr/ucb/pagesize

DESCRIPTION
pagesize prints the size of a page of memory in bytes, as returned by getpagesize. This program is useful in constructing portable shell scripts.

SEE ALSO
getpagesize(3)
NAME
plot, aedplot, bgplot, crtplot, dumbplot, gigiplot, hpplot, implot, t300, t300s, t4013, t450, tek - graphics filters for various plotters

SYNOPSIS
/usr/ucb/plot [ -Tterminal ]

DESCRIPTION
plot reads plotting instructions [see plot(4)] from the standard input and produces plotting instructions suitable for a particular terminal on the standard output.

If no terminal is specified, the environment variable TERM is used. The default terminal is tek.

ENVIRONMENT
Except for ver, the following terminal-types can be used with 'lpr -g' (see lpr) to produce plotted output:

2648 | 2648a | h8 | hp2648 | hp2648a
  Hewlett Packard® 2648 graphics terminal.
300    DASI 300 or GSI terminal (Diablo® mechanism).
300s   DASI 300s terminal (Diablo mechanism).
450    DASI Hyterm 450 terminal (Diablo mechanism).
4013   Tektronix® 4013 storage scope.
4014 | tek Tektronix 4014 and 4015 storage scope with Enhanced Graphics Module. (Use 4013 for Tektronix 4014 or 4015 without the Enhanced Graphics Module).
aded   AED 512 color graphics terminal.
bgplot | bitgraph
  BBN bitgraph graphics terminal.
crt    Any crt terminal capable of running vi(1).
dumb   Dumb terminals without cursor addressing or line printers.
  | un  | unknown
  DEC® vt125 terminal.
    | vt125
h7     | hp7221
    Hewlett Packard 7221 graphics terminal.
implot
    Imagen plotter.
var    Benson Varian printer-plotter
ver    Versatec® D1200A printer-plotter. The output is scan-converted and suitable input to ‘lpr -v’.

10/89
FILES
/usr/ucb/aedplot
/usr/ucb/bgplot
/usr/ucb/crtplot
/usr/ucb/dumbplot
/usr/ucb/gigiplot
/usr/ucb/hpplot
/usr/ucb/implot
/usr/ucb/plot
/usr/ucb/t300
/usr/ucb/t300s
/usr/ucb/t4013
/usr/ucb/t450
/usr/ucb/tek
/usr/ucb/vplot
/var/ucb/vplot
SEE ALSO
lpr(1).
NAME
printenv - display environment variables currently set

SYNOPSIS
/usr/ucb/printenv [ variable ]

DESCRIPTION
printenv prints out the values of the variables in the environment. If a variable
is specified, only its value is printed.

SEE ALSO
tset(1).

DIAGNOSTICS
If a variable is specified and it is not defined in the environment, printenv
returns an exit status of 1.
NAME
prt - display the delta and commentary history of an SCCS file

SYNOPSIS
/usr/ucb/prt [-abdefistu] [-y[SID]] [-c[cutoff]] [-r[rev-cutoff]] filename...

DESCRIPTION
Note: the prt command is an older version of prs(1) that in most circumstances is more convenient to use, but is less flexible than prs.

prt prints part or all of an SCCS file in a useful format. If a directory is named, prt behaves as though each file in the directory were specified as a named file, except that non-SCCS files (last component of the pathname does not begin with s.) and unreadable files are silently ignored. If a name of '-' is given, the standard input is read; each line of the standard input is taken to be the name of an SCCS file to be processed. Again, non-SCCS files and unreadable files are silently ignored.

The following options are available with prt:
- a  Print those types of deltas normally not printed by the d keyletter. These are types R (removed). This keyletter is effective only if the d keyletter is also specified (or assumed).
- b  Print the body of the SCCS file.
- d  This keyletter normally prints delta table entries of the D type.
- e  This keyletter implies the d, i, u, f, and t keyletters and is provided for convenience.
- f  Print the flags of the named file.
- i  Print the serial numbers of those deltas included, excluded, and ignored. This keyletter is effective only if the d keyletter is also specified (or assumed).

The following format is used to print those portions of the SCCS file as specified by the above keyletters. The printing of each delta table entry is preceded by a NEWLINE.
• Type of delta (D or R).
• SPACE.
• SCCS identification string (SID).
• TAB.
• Date and time of creation (in the form YY/MM/DD HH:MM:SS).
• SPACE.
• Creator.
• TAB.
• Serial number.
• SPACE.
• Predecessor delta’s serial number.
-\texttt{s} Print only the first line of the delta table entries; that is, only up to the statistics. This keyletter is effective only if the \texttt{d} keyletter is also specified (or assumed).

-\texttt{t} Print the descriptive text contained in the file.

-\texttt{u} Print the login-names and/or numerical group IDs of those users allowed to make deltas.

-\texttt{y[SID]} Print the delta table entries to stop when the delta just printed has the specified SID. If no delta in the table has the specified SID, the entire table is printed. If no SID is specified, the first delta in the table is printed. This keyletter will print the entire delta table entry for each delta as a single line (the NEWLINE in the normal multi-line format of the \texttt{d} keyletter are replaced by SPACE characters) preceded by the name of the SCCS file being processed, followed by a :, followed by a TAB. This keyletter is effective only if the \texttt{d} keyletter is also specified (or assumed).

-\texttt{c[cutoff]} Stop printing the delta table entries if the delta about to be printed is older than the specified cutoff date-time (see \texttt{get(1)} for the format of date-time). If no date-time is supplied, the epoch 0000 GMT Jan. 1, 1970 is used. As with the \texttt{y} keyletter, this keyletter will cause the entire delta table entry to be printed as a single line and to be preceded by the name of the SCCS file being processed, followed by a :, followed by a TAB. This keyletter is effective only if the \texttt{d} keyletter is also specified (or assumed).

-\texttt{r[rev-cutoff]} Begin printing the delta table entries when the delta about to be printed is older than or equal to the specified cutoff date-time (see \texttt{get(1)} for the format of date-time). If no date-time is supplied, the epoch 0000 GMT Jan. 1, 1970 is used. (In this case, nothing will be printed). As with the \texttt{y} keyletter, this keyletter will cause the entire delta table entry to be printed as a single line and to be preceded by the name of the SCCS file being processed, followed by a :, followed by a TAB. This keyletter is effective only if the \texttt{d} keyletter is also specified (or assumed).
If any keyletter but y, c, or r is supplied, the name of the file being processed (preceded by one NEWLINE and followed by two NEWLINE characters) is printed before its contents.

If none of the u, t, b, or d keyletters is supplied, the d keyletter is assumed.

Note: the s and i keyletters, and the c and r keyletters are mutually exclusive; therefore, they may not be specified together on the same prt command.

The form of the delta table as produced by the y, c, and r keyletters makes it easy to sort multiple delta tables in chronological order.

When both the y and c or the y and r keyletters are supplied, prt will stop printing when the first of the two conditions is met.

SEE ALSO

admin(1), get(1), delta(1), prs(1), what(1), sccs(1).

NAME
ps - display the status of current processes

SYNOPSIS
/usr/ucb/ps [-acqlnrSuUvwx] [-tterm] [num]

DESCRIPTION
The ps command displays information about processes. Normally, only those processes that are running with your effective user ID and are attached to a controlling terminal (see termio(4)) are shown. Additional categories of processes can be added to the display using various options. In particular, the -a option allows you to include processes that are not owned by you (that do not have your user ID), and the -x option allows you to include processes without control terminals. When you specify both -a and -x, you get processes owned by anyone, with or without a control terminal. The -r option restricts the list of processes printed to running and runnable processes.

ps displays the process ID, under PID; the control terminal (if any), under TT; the cpu time used by the process so far, including both user and system time, under TIME; the state of the process, under S; and finally, an indication of the COMMAND that is running.

The state is given by a single letter from the following:

- O Process is running on a processor.
- S Sleeping. Process is waiting for an event to complete.
- R Runnable. Process is on run queue.
- I Idle. Process is being created.
- T Traced. Process stopped by a signal because parent is tracing it.
- X SXBRK state. Process is waiting for more primary memory.

The following options must all be combined to form the first argument:

- -a Include information about processes owned by others.
- -c Display the command name, as stored internally in the system for purposes of accounting, rather than the command arguments, which are kept in the process' address space. This is more reliable, if less informative, since the process is free to destroy the latter information.
- -g Display all processes. Without this option, ps only prints interesting processes. Processes are deemed to be uninteresting if they are process group leaders. This normally eliminates top-level command interpreters and processes waiting for users to login on free terminals.
- -l Display a long listing, with fields F, PPID, CP, PRI, NI, SZ, RSS and WCHAN as described below.
- -n Produce numerical output for some fields. In a user listing, the USER field is replaced by a UID field.
- -r Restrict output to running and runnable processes.
Display accumulated CPU time used by this process and all of its reaped children.

Display user-oriented output. This includes fields USER, SZ, RSS and START as described below.

Update a private database where ps keeps system information.

Display a version of the output containing virtual memory. This includes fields SIZE and RSS, described below.

Use a wide output format (132 columns rather than 80); if repeated, that is, -w, use arbitrarily wide output. This information is used to decide how much of long commands to print.

Include processes with no controlling terminal.

List only process data associated with the terminal, term. Terminal identifiers may be specified in one of two forms: the device's file name (for example, tty04 or term/14) or, if the device's file name starts with tty, just the digit identifier (for example, 04).

A process number may be given, in which case the output is restricted to that process. This option must be supplied last.

**DISPLAY FORMATS**

Fields that are not common to all output formats:

USER Name of the owner of the process.

NI Process scheduling increment [see getpriority(3) and nice(3C)].

SIZE The combined size of the data and stack segments (in kilobyte units)

SZ Real memory (resident set) size of the process (in kilobyte units).

RSS Numerical user-ID of process owner.

UID Numerical ID of parent of process.

PPID Short-term ID of parent process.

PRI The priority of the process (higher numbers mean lower priority).

START The starting time of the process, given in hours, minutes, and seconds. A process begun more than 24 hours before the ps inquiry is executed is given in months and days.

CHAN The address of an event for which the process is sleeping, or in SXBRK state (if blank, the process is running).

F Flags (hexadecimal and additive) associated with the process:

00 Process has terminated. Process table now available.

01 A system process, always in primary memory.

02 Parent is tracing process.

04 Tracing parent's signal has stopped process. Parent is waiting, see ptrace(2).
08 Process is currently in primary memory.
10 Process currently in primary memory, locked until an event is completed.

A process that has exited and has a parent, but has not yet been waited for by the parent is marked `<defunct>`; otherwise, `ps` tries to determine the command name and arguments given when the process was created by examining the user block.

FILES

```
/dev
/dev/sxt/*
/dev/tty*
/dev/xt/* terminal (tty) names searcher files
/dev/kmem kernel virtual memory
/dev/swap default swap device
/dev/mem memory
/etc/passwd UID information supplier
/etc/ps_data internal data structure
```

SEE ALSO

`getpriority(3), nice(3C)`
`kill(1)` in the *User’s Reference Manual.*
`whodo(1)` in the *System Administrator’s Reference Manual.*
`lseek(2)` in the *Programmer’s Reference Manual.*

NOTES

Things can change while `ps` is running; the picture it gives is only a close approximation to the current state. Some data printed for defunct processes is irrelevant.

If no `term` or `num` is specified, `ps` checks the standard input, the standard output, and the standard error in that order, looking for the controlling terminal and will attempt to report on processes associated with the controlling terminal. In this situation, if the standard input, the standard output, and the standard error are all redirected, `ps` will not find a controlling terminal, so there will be no report.

On a heavily loaded system, `ps` may report an `lseek(2)` error and exit. `ps` may seek to an invalid user area address, having obtained the address of process’ user area, `ps` may not be able to seek to that address before the process exits and the address becomes invalid.
NAME
refer - expand and insert references from a bibliographic database

SYNOPSIS

DESCRIPTION
refer is a preprocessor for nroff(1), or troff(1), that finds and formats references. The input files (standard input by default) are copied to the standard output, except for lines between '. [' and '. ]' command lines. Such lines are assumed to contain keywords as for lookbib(1), and are replaced by information from a bibliographic data base. The user can avoid the search, override fields from it, or add new fields. The reference data, from whatever source, is assigned to a set of troff strings. Macro packages such as ms(7) print the finished reference text from these strings. A flag is placed in the text at the point of reference. By default, the references are indicated by numbers.

When refer is used with eqn(1), neqn, or tbl(1), refer should be used first in the sequence, to minimize the volume of data passed through pipes.

The following options are available:

-\( -b \) Bare mode — do not put any flags in text (neither numbers or labels).
-\( -e \) Accumulate references instead of leaving the references where encountered, until a sequence of the form:

\[
\begin{align*}
\cdot & \cdot \\
\$LIST$ & \\
\cdot & 
\end{align*}
\]

is encountered, and then write out all references collected so far. Collapse references to the same source.

-\( -n \) Do not search the default file.
-\( -ar \) Reverse the first \( r \) author names (Jones, J. A. instead of J. A. Jones). If \( r \) is omitted, all author names are reversed.

-\( -cstring \)
Capitalize (with SMALL CAPS) the fields whose key-letters are in string.

-\( -kx \) Instead of numbering references, use key labels as specified in a reference data line beginning with the characters \( \%x \); By default, \( \%x \) is \( \%L \).

-\( -lm,n \) Instead of numbering references, use labels from the senior author’s last name and the year of publication. Only the first \( m \) letters of the last name and the last \( n \) digits of the date are used. If either of \( m \) or \( n \) is omitted, the entire name or date, respectively, is used.

-\( -p \) filename
Take the next argument as a file of references to be searched. The default file is searched last.
-skeys Sort references by fields whose key-letters are in the keys string, and permute reference numbers in the text accordingly. Using this option implies the -e option. The key-letters in keys may be followed by a number indicating how many such fields are used, with a + sign taken as a very large number. The default is AD, which sorts on the senior author and date. To sort on all authors and then the date, for instance, use the options '-sA+T'.

FILES
/usr/ucblib/reftools/papers default publication lists and indexes
/usr/ucblib/reftools programs

SEE ALSO
addbib(1), eqn(1), indxbib(1), lookbib(1), nroff(1), roffbib(1), sortbib(1), tbl(1), troff(1).
NAME
roffbib - format and print a bibliographic database

SYNOPSIS
/usr/ucb/roffbib [-e] [-h] [-Q] [-x] [-m filename] [-np] [ -olist ]
[-raN] [-sN] [-Term] [ filename ] ...

DESCRIPTION
The roffbib command prints out all records in a bibliographic database, in
bibliography format rather than as footnotes or endnotes. Generally it is used in
conjunction with sortbib(1):

example% sortbib database | roffbib

If abstracts or comments are entered following the %X field key, roffbib will for­
mat them into paragraphs for an annotated bibliography. Several %X fields may
be given if several annotation paragraphs are desired.

roffbib accepts all options understood by nroff(1) except -i and -q, as well as
those listed below:

-e Produce equally-spaced words in adjusted lines using full terminal resolu­
tion.

-h Use output tabs during horizontal spacing to speed output and reduce
output character count. TAB settings are assumed to be every 8 nominal
character widths.

-Q Queue output for the phototypesetter. Page offset is set to 1 inch.

-x Suppress printing of abstracts.

-m filename
Prepend the macro file /usr/ucb/lib/doctools/tmac/tmac.name to the
input files. There should be a space between the -m and the macro
filename. This set of macros will replace the ones defined in
/usr/ucb/lib/doctools/tmac/tmac.bib.

-np Number first generated page p.

-olist Print only page numbers that appear in the comma-separated list of
numbers and ranges. A range N-M means pages N through M; an initial
-N means from the beginning to page N; a final N- means from page N to
end.

-raN Set register a (one-character) to N. The command-line argument -raN1 will
number the references starting at 1.

Four command-line registers control formatting style of the bibliography,
much like the number registers of ms(7). The flag -rV2 will double space
the bibliography, while -rV1 will double space references but single space
annotation paragraphs. The line length can be changed from the default
6.5 inches to 6 inches with the -rL6i argument, and the page offset can be
set from the default of 0 to one inch by specifying -rOi (capital O, not
zero).
-sN  Halt prior to every N pages for paper loading or changing (default N = 1).
     To resume, enter NEWLINE or RETURN.

-Tterm
     Specify term as the terminal type.

FILES
     /usr/ucblib/doctools/tmac/tmac.bib
     file of macros used by nroff/troff

SEE ALSO
     addbib(1), idxbib(1), lookbib(1), nroff(1) refer(1), sortbib(1), troff(1).

NOTES
     Users have to rewrite macros to create customized formats.
NAME
secs - front end for the Source Code Control System (SCCS)

SYNOPSIS
/usr/ucb/secs [ -r ] [ -dprefixpath ] [ -pfinalpath ] command [SCCS-flags ...] [filename ...]

DESCRIPTION
The secs command is a front end to the utility programs of the Source Code Control System (SCCS).

secs normally prefixes each filename, or the last component of each filename, with the string 'SCCS/s.', because you normally keep your SCCS database files in a directory called SCCS, and each database file starts with an 's.' prefix. If the environment variable PROJECTDIR is set, and is an absolute pathname (that is, begins with a slash) secs will search for SCCS files in the directory given by that variable. If it is a relative pathname (that is, does not begin with a slash), it is treated as the name of a user, and secs will search in that user's home directory for a directory named src or source. If that directory is found, secs will search for SCCS files in the directory given by that variable.

secs program options must appear before the command argument. Flags to be passed to the actual SCCS command (utility program) must appear after the command argument. These flags are specific to the command being used.

secs also includes the capability to run "set user ID" to another user to provide additional protection. Certain commands (such as admin(1)) cannot be run "set user ID" by all users, since this would allow anyone to change the authorizations. Such commands are always run as the real user.

OPTIONS
-r Run secs as the real user rather than as whatever effective user secs is "set user ID" to.
-dprefixpath
Define the prefix portion of the pathname for the SCCS database files. The default prefix portion of the pathname is the current directory. prefixpath is prefixed to the entire pathname. See EXAMPLE.

This flag overrides any directory specified by the PROJECTDIR environment variable.

-pfinalpath
Define the name of a lower directory in which the SCCS files will be found; SCCS is the default. finalpath is appended before the final component of the pathname. See EXAMPLE.

USAGE
Additional secs Commands
Several "pseudo-commands" are available in addition to the usual SCCS commands. These are:
create create is used when creating new s. files. For example, given a C source language file called 'obscure.c', create would perform the following actions: (1) create the 's.' file called 's.obscure.c' in the SCCS directory; (2) rename the original source file to 'obscure.c';
(3) do an 'sccs get' on 'obscure.c'. Compared to the SCCS admin command, create does more of the startup work for you and should be used in preference to admin.

**enter**  
Enter is just like create, except that it does not do the final 'sccs get'. It is usually used if an 'sccs edit' is to be performed immediately after the enter.

**edit**  
Get a file for editing.

**delget**  
Perform a delta on the named files and then get new versions. The new versions have ID keywords expanded, and so cannot be edited.

**deledit**  
Same as delget, but produces new versions suitable for editing. deledit is useful for making a "checkpoint" of your current editing phase.

**fix**  
Remove the named delta, but leaves you with a copy of the delta with the changes that were in it. fix must be followed by a -r flag. fix is useful for fixing small compiler bugs, etc. Since fix does not leave audit trails, use it carefully.

**clean**  
Remove everything from the current directory that can be recreated from SCCS files. clean checks for and does not remove any files being edited. If 'clean -b' is used, branches are not checked to see if they are currently being edited. Note: -b is dangerous if you are keeping the branches in the same directory.

**unedit**  
"Undo" the last edit or 'get -e' and return a file to its previous condition. If you unedit a file being edited, all changes made since the beginning of the editing session are lost.

**info**  
Display a list of all files being edited. If the -b flag is given, branches (that is, SID's with two or fewer components) are ignored. If the -u flag is given (with an optional argument), only files being edited by you (or the named user) are listed.

**check**  
Check for files currently being edited, like info, but returns an exit code rather than a listing: nothing is printed if nothing is being edited, and a non-zero exit status is returned if anything is being edited. check may thus be included in an "install" entry in a makefile, to ensure that everything is included in an SCCS file before a version is installed.

**tell**  
Display a list of files being edited on the standard output. Filenames are separated by NEWLINE characters. Take the -b and -u flags like info and check.

**diffs**  
Compare (in diff-like format) the current version of the program you have out for editing and the versions in SCCS format. diffs accepts the same arguments as diff, except that the -c flag must be specified as -C instead, because the -c flag is taken as a flag to get indicating which version is to be compared with the current version.
print  Print verbose information about the named files. print does an
'sccs prs -e' followed by an 'sccs get -p -m' on each file.

EXAMPLE
The command:

    sccs -d/usr/include get sys/inode.h

converts to:

    get /usr/include/sys/SCCS/s.inode.h

The intent here is to create aliases such as:

    alias syssccs sccs -d/usr/src

which will be used as:

    syssccs get cmd/who.c

The command:

    sccs -pprivate get usr/include/stdio.h

converts to:

    get usr/include/private/s.stdio.h

To put a file called myprogram.c into SCCS format for the first time, assuming
also that there is no SCCS directory already existing:

    $ mkdir SCCS
    $ sccs create myprogram.c
    $ myprogram.c:
        1.1
        14 lines
    after you have verified that everything is all right
    you remove the version of the file that starts with a comma:
    $ rm myprogram.c
    $

To get a copy of myprogram.c for editing, edit that file, then place it back in the
SCCS database:

    $ sccs edit myprogram.c
        1.1
        new delta 1.2
        14 lines
    $ vi myprogram.c
    your editing session
    $ sccs delget myprogram.c
    comments? Added abusive responses for compatibility
        1.2
        7 inserted
        7 deleted
        7 unchanged
        1.2
        14 lines
    $
To get a file from another directory:
    sccs -p/usr/src/sccs/ get cc.c
or:
    sccs get /usr/src/sccs/cc.c
To make a delta of a large number of files in the current directory:
    sccs delta *.c
To get a list of files being edited that are not on branches:
    sccs info -b
To delta everything that you are editing:
    $ sccs delta `sccs tell -u`
In a makefile, to get source files from an SCCS file if it does not already exist:
    SRCS = <list of source files>
    $(SRCS):
        sccs get $(REL) $@

Regular sccs Commands

The "regular" SCCS commands are described very briefly below. It is unlikely
that you ever need to use these commands because the user interface is so com­
plicated, and the sccs front end command does 99.9% of the interesting tasks for
you.
admin      Create new SCCS files and changes parameters of existing SCCS files.
You can use `sccs create` to create new SCCS files, or use `sccs admin` to do other things.
add          Change the commentary material in an SCCS delta.
comb        Combine SCCS deltas and reconstructs the SCCS files.
delta      Permanently introduces changes that were made to a file previously
            retrieved using `sccs get`. You can use `sccs delget` as the more
            useful version of this command since `sccs delget` does all of the
            useful work and more.
get        Extract a file from the SCCS database, either for compilation, or for
            editing when the `-e` option is used. Use `sccs get` if you really
            need it, but `sccs delget` will normally have done this job for you.
            Use `sccs edit` instead of `get` with the `-e` option.
help        Supposed to help you interpret SCCS error messages.
prs         Display information about what is happening in an SCCS file.
rmdel       Remove a delta from an SCCS file.
sccsdiff    Compare two versions of an SCCS file and generates the differences
            between the two versions.
val Determine if a given SCCS file meets specified criteria. If you use the `sccs` command, you should not need to use `val`, because its user interface is unbelievable.

what Display SCCS identification information.

FILES
/usr/sccs/*

SEE ALSO

NOTES
The `help` command usually just parrots SCCS error messages and is generally not considered very helpful.
NAME
soelim - resolve and eliminate .so requests from nroff or troff input

SYNOPSIS
/usr/ucb/soelim [ filename ... ]

DESCRIPTION
The soelim command reads the specified files or the standard input and per­
foms the textual inclusion implied by the nroff(1) directives of the form

.so somefile

directives when they appear at the beginning of input lines. This is useful since programs
such as tbl(1) do not normally do this; it allows the placement of individual
tables in separate files to be run as a part of a large document.
An argument consisting of '-' is taken to be a file name corresponding to the
standard input.

Note: inclusion can be suppressed by using `\` instead of `.`, that is,

so /usr/ucb/lib/doctools/tmac/tmac.s

EXAMPLE
A sample usage of soelim would be

soelim exum?.n | tbl | nroff -ms | col | lpr

SEE ALSO
nroff(1), tbl(1).
NAME
   sortbib - sort a bibliographic database

SYNOPSIS
   /usr/ucb/sortbib [ -skey-letters ] database...

DESCRIPTION
   The sortbib command sorts files of records containing refer key-letters by
   user-specified keys. Records may be separated by blank lines, or by `.`[`'` and `.']` 
delimiters, but the two styles may not be mixed together. This program reads 
through each database and pulls out key fields, which are sorted separately. The 
sorted key fields contain the file pointer, byte offset, and length of corresponding 
records. These records are delivered using disk seeks and reads, so sortbib may 
not be used in a pipeline to read standard input.

   By default, sortbib alphabetizes by the first `%A` and the `%D` fields, which contain 
the senior author and date. The `-s` option is used to specify new key-letters. See 
addbib for a list of the most common key letters. For instance, `-sATD` will sort 
by author, title, and date, while `-sA+D` will sort by all authors, and date. Sort 
keys past the fourth are not meaningful. No more than 16 databases may be 
sorted together at one time. Records longer than 4096 characters will be truncated.

   sortbib sorts on the last word on the `%A` line, which is assumed to be the 
author's last name. A word in the final position, such as `jr.` or `ed.` will be 
ignored if the name beforehand ends with a comma. Authors with two-word last 
names or unusual constructions can be sorted correctly by using the nroff con-
vention `
``0` in place of a blank. A `%Q` field is considered to be the same as `%A`, 
except sorting begins with the first, not the last, word. sortbib sorts on the last 
word of the `%D` line, usually the year. It also ignores leading articles (like `A` or 
`The`) when sorting by titles in the `%T` or `%J` fields; it will ignore articles of any 
modern European language. If a sort-significant field is absent from a record, 
sortbib places that record before other records containing that field.

SEE ALSO
   addbib(1), indxbib(1), lookbib(1), refer(1), roffbib(1).

NOTES
   Records with missing author fields should probably be sorted by title.
NAME

stty — set the options for a terminal

SYNOPSIS

/usr/ucb/stty [-a] [-g] [-h] [options]

DESCRIPTION

stty sets certain terminal I/O options for the device that is the current standard input; without arguments, it reports the settings of certain options.

In this report, if a character is preceded by a caret (^), then the value of that option is the corresponding CTRL character (e.g., "^-h" is CTRL-h; in this case, recall that CTRL-h is the same as the “back-space” key.) The sequence "..." means that an option has a null value.

-a reports all of the option settings;
-g reports current settings in a form that can be used as an argument to another stty command.
-h reports all the option settings with the control characters in an easy to read column format.

Options in the last group are implemented using options in the previous groups. Note that many combinations of options make no sense, but no sanity checking is performed. Hardware flow control and clock modes options may not be supported by all hardware interfaces. The options are selected from the following:

Special Requests

all Reports the same option settings as stty without arguments, but with the control characters in column format.

everything Everything stty knows about is printed. Same as -- option.
speed The terminal speed alone is reported on the standard output.
size The terminal (window) sizes are printed on the standard output, first rows and then columns. This option is only appropriate if currently running a window system.

size and speed always report on the settings of /dev/tty, and always report the settings to the standard output.

Control Modes

parenb (-parenb) enable (disable) parity generation and detection.
parext (-parext) enable (disable) extended parity generation and detection for mark and space parity.
parodd (-parodd) select odd (even) parity, or mark (space) parity if parenb is enabled.

cs5 cs6 cs7 cs8 select character size [see termio(7)].
0  
110 300 600 1200 1800 2400 4800 9600 19200 exta 38400 extb

Set terminal baud rate to the number given, if possible. (All speeds are not supported by all hardware interfaces.)

ispeed 0 110 300 600 1200 1800 2400 4800 9600 19200 exta 38400 extb

Set terminal input baud rate to the number given, if possible. (Not all hardware supports split baud rates.) If the input baud rate is set to zero, the input baud rate will be specified by the value of the output baud rate.

ospeed 0 110 300 600 1200 1800 2400 4800 9600 19200 exta 38400 extb

Set terminal output baud rate to the number given, if possible. (Not all hardware supports split baud rates.) If the baud rate is set to zero, the line will be hung up immediately.

hupcl (-hupcl)  

hang up (do not hang up) connection on last close.

hup (-hup)  

same as hupcl (-hupcl).

cstopb (-cstopb)  

use two (one) stop bits per character.

cread (-cread)  

enable (disable) the receiver.

clocal (-clocal)  

assume a line without (with) modem control.

loblk (-loblk)  

block (do not block) output from a non-current layer.

Input Modes

ignbrk (-ignbrk)  

ignore (do not ignore) break on input.

brkint (-brkint)  

signal (do not signal) INTR on break.

ignpar (-ignpar)  

ignore (do not ignore) parity errors.

parmrk (-parmrk)  

mark (do not mark) parity errors [see termio(7)].

inpck (-inpck)  

enable (disable) input parity checking.

istrip (-istrip)  

strip (do not strip) input characters to seven bits.

inlcr (-inlcr)  

map (do not map) NL to CR on input.

igncr (-igncr)  

ignore (do not ignore) CR on input.

icrnl (-icrnl)  

map (do not map) CR to NL on input.

iuclc (-iuclc)  

map (do not map) upper-case alphabetics to lower case on input.

ixon (-ixon)  

enable (disable) START/STOP output control. Output is stopped by sending an STOP and started by sending an START.

ixany (-ixany)  

allow any character (only START) to restart output.
decctlq (-decctlq) Same as -ixany.
ixoff (-ixoff) request that the system send (not send) START/STOP characters when the input queue is nearly empty/full.
tandem (-tandem) Same as ixoff.
imaxbel (-imaxbel) echo (do not echo) BEL when the input line is too long.
iexten (-iexten) enable (disable) extended (implementation-defined) functions for input data.

Output Modes
opost (-opost) post-process output (do not post-process output; ignore all other output modes).
olcuc (-olcuc) map (do not map) lower-case alphabets to upper case on output.
onlcr (-onlcr) map (do not map) NL to CR-NL on output.
ocrn1 (-ocrn1) map (do not map) CR to NL on output.
onocr (-onocr) do not (do) output CRs at column zero.
onlret (-onlret) on the terminal NL performs (does not perform) the CR function.
ofill (-ofill) use fill characters (use timing) for delays.
ofdel (-ofdel) fill characters are DELs (NULs).
crO cr1 cr2 cr3 select style of delay for carriage returns [see termio(7)].
n10 n11 select style of delay for line-feeds [see termio(7)].
tab0 tab1 tab2 tab3 select style of delay for horizontal tabs [see termio(7)].
bs0 bs1 select style of delay for backspaces [see termio(7)].
ff0 ff1 select style of delay for form-feeds [see termio(7)].
vt0 vt1 select style of delay for vertical tabs [see termio(7)].

Local Modes
isig (-isig) enable (disable) the checking of characters against the special control characters INTR, QUIT, and SWTCH.
icanon (-icanon) enable (disable) canonical input (ERASE and KILL processing).
cbreak (-cbreak) Same as -icanon.
xcase (-xcase) canonical (unprocessed) upper/lower-case presentation.
echo (-echo) echo back (do not echo back) every character typed.
**echoe (-echoe)**

Echo (do not echo) ERASE character as a backspace-space-backspace string. Note: this mode will erase the ERASEed character on many CRT terminals; however, it does not keep track of column position and, as a result, may be confusing on escaped characters, tabs, and backspaces.

**crterase (-crterase)**

Same as echoe.

**echok (-echok)**

Echo (do not echo) NL after KILL character.

**lfkc (-lfkc)**

The same as echok (-echok); obsolete.

**echonl (-echonl)**

Echo (do not echo) NL.

**noflush (-noflush)**

Disable (enable) flush after INTR, QUIT, or SWTCH.

**stwrap (-stwrap)**

Disable (enable) truncation of lines longer than 79 characters on a synchronous line. (Does not apply to the 3B2.)

**tostop (-tostop)**

Send (do not send) SIGTTOU for background processes.

**echoctl (-echoctl)**

Echo (do not echo) control characters as `char`, delete as `?`

**ctlecho (-ctlecho)**

Same as echoctl.

**echoprt (-echoprt)**

Echo (do not echo) erase character as character is "erased".

**prterase (-prterase)**

Same as echoprt.

**echoke (-echoke)**

BS-SP-BS erase (do not BS-SP-BS erase) entire line on line kill.

**crtkill (-crtkill)**

Same as echoke.

**flusho (-flusho)**

Output is (is not) being flushed.

**pendin (-pendin)**

Retype (do not retype) pending input at next read or input character.

**stflush (-stflush)**

Enable (disable) flush on a synchronous line after every **write(2)**. (Does not apply to the 3B2.)

**stappl (-stappl)**

Use application mode (use line mode) on a synchronous line. (Does not apply to the 3B2.)

**Hardware Flow Control Modes**

**rtsxoff (-rtsxoff)**

Enable (disable) RTS hardware flow control on input.

**ctsxon (-ctsxon)**

Enable (disable) CTS hardware flow control on output.

**dterxoff (-dterxoff)**

Enable (disable) DTER hardware flow control on input.
stty(1)

**rlsdxon (-rlsdxon)**

enable (disable) RLSD hardware flow control on output.

**isxoff (-isxoff)**

enable (disable) isochronous hardware flow control on input.

**Clock Modes**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xctset</td>
<td>get the transmit clock from transmitter signal element timing (DCE source) lead, CCITT V.24 circuit 114, EIA-232-D pin 15.</td>
</tr>
<tr>
<td>xcrset</td>
<td>get transmit clock from receiver signal element timing (DCE source) lead, CCITT V.24 circuit 115, EIA-232-D pin 17.</td>
</tr>
<tr>
<td>rcibrg</td>
<td>get receive clock from internal baud rate generator.</td>
</tr>
<tr>
<td>rctset</td>
<td>get receive clock from transmitter signal element timing (DCE source) lead, CCITT V.24 circuit 114, EIA-232-D pin 15.</td>
</tr>
<tr>
<td>rcrset</td>
<td>get receive clock from receiver signal element timing (DCE source) lead, CCITT V.24 circuit 115, EIA-232-D pin 17.</td>
</tr>
<tr>
<td>tsetcof</td>
<td>transmitter signal element timing clock not provided.</td>
</tr>
<tr>
<td>tsetcr</td>
<td>output receive clock on transmitter signal element timing (DTE source) lead, CCITT V.24 circuit 113, EIA-232-D pin 24, clock source.</td>
</tr>
<tr>
<td>tsetcx</td>
<td>output transmit clock on transmitter signal element timing (DTE source) lead, CCITT V.24 circuit 113, EIA-232-D pin 24, clock source.</td>
</tr>
<tr>
<td>rsetcof</td>
<td>receiver signal element timing clock not provided.</td>
</tr>
<tr>
<td>rsetc</td>
<td>output receive clock on receiver signal element timing (DTE source) lead, CCITT V.24 circuit 128, no EIA-232-D pin, clock source.</td>
</tr>
<tr>
<td>resetcx</td>
<td>output transmit clock on receiver signal element timing (DTE source) lead, CCITT V.24 circuit 128, no EIA-232-D pin, clock source.</td>
</tr>
</tbody>
</table>

**Control Assignments**

Given a control-character \( c \), the corresponding control character is set to \( c \), where control-character is:

- intr
- quit
- erase
- kill
- eof
- eol
- eol2
- swtch
- start
- stop
- susp
- dsusp
- rprt
- flush
- werase
- lnext
- min
- time
- brk

Note: ctab, time, or brk) [ctab is used with -stappl; min and time are used with -icanon; see termio(7)]. If \( c \) is preceded by an (escaped from the shell) caret (^), then the value used is the corresponding CTRL character (e.g., "^d" is a CTRL-d); "^?" is interpreted as DEL and "^~" is interpreted as undefined.
line $i$ set line discipline to $i$ ($0 < i < 127$).

**Combination Modes**

- **evenp or parity** enable parenb and cs7.
- **–evenp, or –parity** disable parenb, and set cs8.
- **even (–even)** Same as evenp (–evenp).
- **oddp** enable parenb, cs7, and parodd.
- **–oddp** disable parenb and parodd, and set cs8.
- **odd (–odd)** Same as oddp (–oddp).
- **spacep** enable parenb, cs7, and parext.
- **–spacep** disable parenb and parext, and set cs8.
- **markp** enable parenb, cs7, parodd, and parext.
- **–markp** disable parenb, parodd, and parext, and set cs8.

**raw (–raw or cooked)** enable (disable) raw input and output (no ERASE, KILL, INTR, QUIT, SWTC, EOT, or output post processing).

- **nl (–nl)** unset (set) icrnl, onlcr. In addition –nl unsets inlcr, igncr, ocrnl, and onlret.
- **lcase (–lcase)** set (unset) xcase, iuc1c, and olcuc.
- **LCASE (–LCASE)** same as lcase (–lcase).

**tabs (–tabs or tab3)** preserve (expand to spaces) tabs when printing.

- **ek** reset ERASE and KILL characters back to normal $\#$ and $\&$.
- **sane** resets all modes to some reasonable values.
- **term** set all modes suitable for the terminal type term, where term is one of tty33, tty37, vt05, tn300, ti700, or tek.
- **async** set normal asynchronous communications where clock settings are xcibrg, rcibrg, tsetcoff and rsetcoff.
- **litout (–litout)** Disable (enable) parenb, istrip, and opost, and set cs8 (cs7).
- **pass8 (–pass8)** Disable (enable) parenb and istrip, and set cs8 (cs7).
- **crt** Set options for a CRT (echoe, echoctl, and, if $\geq$ 1200 baud, echoke).
- **dec** Set all modes suitable for Digital Equipment Corp. operating systems users (ERASE, KILL, and INTR characters to $^?$, $^U$, and $^C$, decctlq, and crt.)
Window Size

rows n    set window size to n rows.
columns n  set window size to n columns.
cols n    An alias for columns n.
ypixels n  set vertical window size to n pixels.
xpixels n  set horizontal window size to n pixels.

SEE ALSO

tabs(1).
NAME

sum - calculate a checksum for a file

SYNOPSIS

/usr/ucb/sum filename

DESCRIPTION

sum calculates and displays a 16-bit checksum for the named file, and also
displays the size of the file in kilobytes. It is typically used to look for bad spots,
or to validate a file communicated over some transmission line. The checksum is
calculated by an algorithm which may yield different results on machines with
16-bit ints and machines with 32-bit ints, so it cannot always be used to validate
that a file has been transferred between machines with different-sized ints.

SEE ALSO


DIAGNOSTICS

Read error is indistinguishable from EOF on most devices; check the block
count.

NOTES

Obsolescent.
NAME
  tbl – format tables for nroff or troff

SYNOPSIS
  /usr/ucb/tbl [-me] [-ms] [-mm] [-TX] [filename] ...

DESCRIPTION
  The tbl command is a preprocessor for formatting tables for nroff or troff. The input filenames are copied to the standard output, except that lines between .TS and .TE command lines are assumed to describe tables and are reformatted.

  If no arguments are given, tbl reads the standard input, so tbl may be used as a filter. When tbl is used with eqn or neqn the tbl command should be first, to minimize the volume of data passed through pipes.

  The -me option copies the -me macro package to the front of the output file.
  The -ms option copies the -ms macro package to the front of the output file.
  The -mm option copies the -mn macro package to the front of the output file.
  The -TX option produces output that does not have fractional line motions in it.

EXAMPLE
  As an example, letting \t represent a TAB (which should be typed as a genuine TAB) the input

  .TS
  c s s
  c c s
  c c c
  l n n.
  Household Population
  Town\tHouseholds
  \tNumber\tSize
  Bedminster\t789\t3.26
  Bernards Twp.\t3087\t3.74
  Bernardsville\t2018\t3.30
  Bound Brook\t3425\t3.04
  Branchburg\t1644\t3.49
  Bridgewater\t7897\t3.81
  Far Hills\t240\t3.19
  .TE

  yields

  Household Population
  Town                     Households
  Number                  Size
  Bedminster              789       3.26
  Bernards Twp.           3087      3.74
  Bernardsville           2018      3.30
  Bound Brook             3425      3.04
  Branchburg              1644      3.49
  Bridgewater             7897      3.81
  Far Hills               240       3.19

SEE ALSO
  eqn(1), nroff(1), troff(1).
NAME
tcopy - copy a magnetic tape

SYNOPSIS
/usr/ucb/tcopy source [ destination ]

DESCRIPTION
tcopy copies the magnetic tape mounted on the tape drive specified by the source argument. The only assumption made about the contents of a tape is that there are two tape marks at the end.

When only a source drive is specified, tcopy scans the tape, and displays information about the sizes of records and tape files. If a destination is specified, tcopy makes a copies the source tape onto the destination tape, with blocking preserved. As it copies, tcopy produces the same output as it does when only scanning a tape.

SEE ALSO
mt(1)

NOTES
tcopy will only run on systems supporting an associated set of ioc(2) requests.
NAME
test – condition evaluation command

SYNOPSIS
/usr/ucb/test expr
[ expr ]

DESCRIPTION
test evaluates the expression expr and, if its value is true, sets a zero (true) exit status; otherwise, a non-zero (false) exit status is set; test also sets a non-zero exit status if there are no arguments. When permissions are tested, the effective user ID of the process is used.

All operators, flags, and brackets (brackets used as shown in the second SYNOPSIS line) must be separate arguments to the test command; normally these items are separated by spaces.

The following primitives are used to construct expr:

- `-r file` true if file exists and is readable.
- `-w file` true if file exists and is writable.
- `-x file` true if file exists and is executable.
- `-f file` true if file exists and is a regular file. Alternatively, if /usr/sh users specify /usr/ucb before /usr/bin in their PATH environment variable, then test will return true if file exists and is (not-a-directory). This is also the default for /usr/bin/csh users.
- `-d file` true if file exists and is a directory.
- `-c file` true if file exists and is a character special file.
- `-b file` true if file exists and is a block special file.
- `-p file` true if file exists and is a named pipe (fifo).
- `-u file` true if file exists and its set-user-ID bit is set.
- `-g file` true if file exists and its set-group-ID bit is set.
- `-k file` true if file exists and its sticky bit is set.
- `-s file` true if file exists and has a size greater than zero.
- `-t` [ fildes ] true if the open file whose file descriptor number is fildes (1 by default) is associated with a terminal device.
- `-z s1` true if the length of string s1 is zero.
- `-n s1` true if the length of the string s1 is non-zero.
- `s1 = s2` true if strings s1 and s2 are identical.
- `s1 != s2` true if strings s1 and s2 are not identical.
- `s1` true if s1 is not the null string.
\[ n1 \ -eq \ n2 \] true if the integers \( n1 \) and \( n2 \) are algebraically equal. Any of the comparisons \(-ne, -gt, -ge, -lt, \) and \(-le\) may be used in place of \(-eq\).

\[-Lfile\] true if file exists and is a symbolic link. With all other primitives, the symbolic links are followed by default.

These primaries may be combined with the following operators:

- ! unary negation operator.
- -a binary and operator.
- -o binary or operator (\(-a\) has higher precedence than \(-o\)).
- ( expr ) parentheses for grouping. Notice also that parentheses are meaningful to the shell and, therefore, must be quoted.

SEE ALSO

NOTES
The ‘not a directory’ alternative to the \(-f\) option is a transition aid for BSD applications and may not be supported in future releases.

The \(-L\) option is a migration aid for users of other shells which have similar options and may not be supported in future releases.

If you test a file you own (the \(-r, -w, \) or \(-x\) tests), but the permission tested does not have the owner bit set, a non-zero (false) exit status will be returned even though the file may have the group or other bit set for that permission. The correct exit status will be set if you are super-user.

The = and != operators have a higher precedence than the \(-r\) through \(-n\) operators, and = and != always expect arguments; therefore, = and != cannot be used with the \(-r\) through \(-n\) operators.

If more than one argument follows the \(-r\) through \(-n\) operators, only the first argument is examined; the others are ignored, unless a \(-a\) or a \(-o\) is the second argument.
tr(1)

NAME
   tr - translate characters

SYNOPSIS
   /usr/ucb/tr [ -cde ] [ string1 [ string2 ] ]

DESCRIPTION
   tr copies the standard input to the standard output with substitution or
deletion of selected characters. The arguments string1 and string2 are considered sets of
characters. Any input character found in string1 is mapped into the character in
the corresponding position within string2. When string2 is short, it is padded to
the length of string1 by duplicating its last character.

In either string the notation:
       a-b

denotes a range of characters from a to b in increasing ASCII order. The character
\, followed by 1, 2 or 3 octal digits stands for the character whose ASCII code is
given by those digits. As with the shell, the escape character \, followed by any
other character, escapes any special meaning for that character.

OPTIONS
   Any combination of the options -c, -d, or -s may be used:
   -c     Complement the set of characters in string1 with respect to the universe of
           characters whose ASCII codes are 01 through 0377 octal.
   -d     Delete all input characters in string1.
   -s     Squeeze all strings of repeated output characters that are in string2 to sin-
gle characters.

EXAMPLE
   The following example creates a list of all the words in filename1 one per line in
   filename2, where a word is taken to be a maximal string of alphabetics. The
   second string is quoted to protect \' from the shell. 012 is the ASCII code for
   NEWLINE.

   tr -cs A-Za-z \'012\' <filename1>filename2

SEE ALSO

NOTES
   Will not handle ASCII NUL in string1 or string2. tr always deletes NUL from
   input.
NAME
troff - typeset or format documents

SYNOPSIS
[-sN] [-Tddest] [-uN] [filename] ...

DESCRIPTION
troff formats text in the filenames. Input to troff is expected to consist of text interspersed with formatting requests and macros. If no filename argument is present, troff reads standard input. A - as a filename argument indicates that standard input is to be read at that point in the list of input files; troff reads the files named ahead of the - in the arguments list, then text from the standard input, and then text from the files named after the -.

The following options may appear in any order, but they all must appear before the first filename.
-a Send a printable approximation of the formatted output to the standard output file.
-f Do not print a trailer after the final page of output or cause the postprocessor to relinquish control of the device.
-i Read the standard input after the input files are exhausted.
-z Suppress formatted output. Only diagnostic messages and messages output using the .tm request are output.
-Fdir Search the directory dir for font width tables instead of the system-dependent default directory.
-mname Prepend the macro file /usr/lib/tmac/tmac.name to the input filenames. Note: most references to macro packages include the leading m as part of the name; for example, the man macro package resides in /usr/lib/tmac/tmac.an.
-nN Number first generated page N.
-o list Print only pages whose page numbers appear in the comma-separated list of numbers and ranges. A range N-M means pages N through M; an initial -N means from the beginning to page N; and a final N- means from N to the end.
-raN Set register a (one-character) to N.
-sN Stop the phototypesetter every N pages. On some devices, troff produces a trailer so you can change cassettes; resume by pressing the typesetter's start button.
-Tdest Prepare output for typesetter dest. The following values can be supplied for dest:
  202 Mergenthaler Linotron 202. This is the default value.
  cat Graphics Systems C/A/T.
  aps Autologic APS-5.
-uN Set the emboldening factor for the font mounted in position 3 to N. If N is missing, then set the emboldening factor to 0.
FILES
/tmp/trtmp temporary file
/usr/ucblib/doctools/tmac/tmac.* standard macro files
/usr/ucblib/doctools/font/* font width tables for alternate mounted troff fonts

SEE ALSO
checknr(1), chmod(1), eqn(1), lpd(1M), lpr(1), nroff(1), tbl(1), man(7), me(7),
ms(7).

NAME

tset, reset - establish or restore terminal characteristics

SYNOPSIS

tset [-InQrs] [-ec] [-kc] [-m] [port-ID: baudrate: type] ...
    [-m] [indent] [test baudrate: type] ...

DESCRIPTION

tset sets up your terminal, typically when you first log in. It does terminal
dependent processing such as setting erase and kill characters, setting or resetting
delays, sending any sequences needed to properly initialized the terminal, and the
like. tset first determines the type of terminal involved, and then does necessary
initializations and mode settings. If a port is not wired permanently to a specific
terminal (not hardwired) it is given an appropriate generic identifier such as
dialup.

reset clears the terminal settings by turning off CBREAK and RAW modes, output
delays and parity checking, turns on NEWLINE translation, echo and TAB expansion,
and restores undefined special characters to their default state. It then sets
the modes as usual, based on the terminal type (which will probably override
some of the above). See stty(1) for more information. All arguments to tset
may be used with reset. reset also uses rs= and rf= to reset the initialization
string and file. This is useful after a program dies and leaves the terminal in a
funny state. Often in this situation, characters will not echo as you type them.
You may have to type `<LINEFEED>reset<LINEFEED>' since `<RETURN>' may not
work.

When no arguments are specified, tset reads the terminal type from the TERM
environment variable and re-initializes the terminal, and performs initialization of
mode, environment and other options at login time to determine the terminal
type and set up terminal modes.

When used in a startup script (.profile for sh(1) users or .login for csh(1)
users) it is desirable to give information about the type of terminal you will usu­
ally use on ports that are not hardwired. Any of the alternate generic names
given in /etc/termcap may be used for the identifier. Refer to the -m option
below for more information. If no mapping applies and a final type option, not
preceded by a -m, is given on the command line then that type is used.

It is usually desirable to return the terminal type, as finally determined by tset,
and information about the terminal's capabilities, to a shell's environment. This
can be done using the -s, -S, or -s options.

For the Bourne shell, put this command in your .profile file:

    eval `tset -s options...`

or using the C shell, put this command in your .login file:

    eval `tset -s options...`
With the C shell, it is also convenient to make an alias in your .cshrc file:

```
alias tset 'eval `tset -s \!*`'
```

This also allows the command:

```
tset 2621
```

to be invoked at any time to set the terminal and environment. It is not possible
to get this aliasing effect with a Bourne shell script, because shell scripts cannot
set the environment of their parent. If a process could set its parent's environ-
ment, none of this nonsense would be necessary in the first place.

Once the terminal type is known, tset sets the terminal driver mode. This nor-
mally involves sending an initialization sequence to the terminal, setting the sin-
gle character erase (and optionally the line-kill (full line erase)) characters, and
setting special character delays. TAB and NEWLINE expansion are turned off dur-
ing transmission of the terminal initialization sequence.

On terminals that can backspace but not overstrike (such as a CRT), and when the
erase character is 't', the erase character is changed as if -e had been used.

The following options are available with tset:

- `-n` Specify that the new tty driver modes should be initialized for this termi-
nal. Probably useless since stty new is the default.

- `-Q` Suppress printing the 'Erase set to' and 'Kill set to' messages.

- `-r` In addition to other actions, reports the terminal type.

- `-s` Output commands to set and export TERM. This can be used with

```
set noglob
eval `tset -s ```
```
unset noglob
```
to bring the terminal information into the environment. Doing so makes programs such as vi(1) start up faster. If the SHELL environment variable ends with csh, C shell commands are output, otherwise Bourne shell commands are output.

\[-m\ [port-ID|baudrate]:type\] ...

Specify (map) a terminal type when connected to a generic port (such as dialup or plugboard) identified by port-ID. The baudrate argument can be used to check the baudrate of the port and set the terminal type accordingly. The target rate is prefixed by any combination of the following operators to specify the conditions under which the mapping is made:

> Greater than
@ Equals or "at"
< Less than
! It is not the case that (negates the above operators)
? Prompt for the terminal type. If no response is given, then type is selected by default.

In the following example, the terminal type is set to adm3a if the port is a dialup with a speed of greater than 300 or to dw2 if the port is a dialup at 300 baud or less. In the third case, the question mark preceding the terminal type indicates that the user is to verify the type desired. A NULL response indicates that the named type is correct. Otherwise, the user’s response is taken to be the type desired.

\[tset -m 'dialup>300:adm3a' -m 'dialup:dw2' -m \ 'plugboard:?adm3a'\]

To prevent interpretation as metacharacters, the entire argument to \[-m\] should be enclosed in single quotes. When using the C shell, exclamation points should be preceded by a backslash (\).

**EXAMPLES**

These examples all use the ‘-’ option. A typical use of tset in a .profile or .login will also use the -e and -k options, and often the -n or -Q options as well. These options have been omitted here to keep the examples short.

To select a 2621, you might put the following sequence of commands in your .login file (or .profile for Bourne shell users).

```
set noglob
eval `tset -s 2621`
unset noglob
```

If you have a switch which connects to various ports (making it impractical to identify which port you may be connected to), and use various terminals from time to time, you can select from among those terminals according to the speed or baud rate. In the example below, tset will prompt you for a terminal type if the baud rate is greater than 1200 (say, 9600 for a terminal connected by an RS-232 line), and use a Wyse® 50 by default. If the baud rate is less than or equal to 1200, it will select a 2621. Note the placement of the question mark, and the quotes to protect the > and ? from interpretation by the shell.
The following entry is appropriate if you always dial up, always at the same baud rate, on many different kinds of terminals, and the terminal you use most often is an adm3a.

```
set noglob
eval `tset -s ?adm3a`
unset noglob
```

If you want to make the selection based only on the baud rate, you might use the following:

```
set noglob
eval `tset -s >1200:wy` 2621`
unset noglob
```

The following example quietly sets the erase character to BACKSPACE, and kill to CTRL-U. If the port is switched, it selects a Concept™ 100 for speeds less than or equal to 1200, and asks for the terminal type otherwise (the default in this case is a Wyse 50). If the port is a direct dialup, it selects Concept 100 as the terminal type. If logging in over the ARPANET, the terminal type selected is a Datamedia® 2500 terminal or emulator. Note the backslash escaping the NEWLINE at the end of the first line in the example.

```
set noglob
eval `tset -e -k^U -Q -s -m 'switch<=l200:concept100' -m 'switch:?wy' -m dialup:concept100 -m arpanet:dm2500`
unset noglob
```

FILES

.loqin
.profile

SEE ALSO


NOTES

The tset command is one of the first commands a user must master when getting started on a UNIX system. Unfortunately, it is one of the most complex, largely because of the extra effort the user must go through to get the environment of the login shell set. Something needs to be done to make all this simpler, either the login program should do this stuff, or a default shell alias should be made, or a way to set the environment of the parent should exist.

This program cannot intuit personal choices for erase, interrupt and line kill characters, so it leaves these set to the local system standards.

It could well be argued that the shell should be responsible for ensuring that the terminal remains in a sane state; this would eliminate the need for the reset program.
NAME
ul - underline

SYNOPSIS
/usr/ucb/ul [ -i ] [ -t terminal ] [ filename... ]

DESCRIPTION
The ul command reads the named filenames (or the standard input if none are given) and translates occurrences of underscores to the sequence which indicates underlining for the terminal in use, as specified by the environment variable TERM. ul uses the /usr/share/lib/termcap file to determine the appropriate sequences for underlining. If the terminal is incapable of underlining, but is capable of a standout mode then that is used instead. If the terminal can overstrike, or handles underlining automatically, ul degenerates to cat. If the terminal cannot underline, underlining is ignored.

The following options are available:

-t terminal  Override the terminal kind specified in the environment. If the terminal cannot underline, underlining is ignored.

-i  Indicate underlining by a separate line containing appropriate dashes --; this is useful when you want to look at the underlining which is present in an nroff output stream on a CRT-terminal.

SEE ALSO
man(1), nroff(1)
unifdef - resolve and remove ifdef'ed lines from C program source

SYNOPSIS
/usr/ucb/unifdef [ -c ] [ -Dname ] [ -Uname ] [ -iDname ] [ -iUname ] ... [ filename ]

DESCRIPTION
unifdef removes ifdefed lines from a file while otherwise leaving the file alone. It is smart enough to deal with the nested ifdefs, comments, single and double quotes of C syntax, but it does not do any including or interpretation of macros. Neither does it strip out comments, though it recognizes and ignores them. You specify which symbols you want defined with -D options, and which you want undefined with -U options. Lines within those ifdefs will be copied to the output, or removed, as appropriate. Any ifdef, ifndef, else, and endif lines associated with filename will also be removed.

ifdefs involving symbols you do not specify are untouched and copied out along with their associated ifdef, else, and endif lines. If an ifdefX occurs nested inside another ifdefX, then the inside ifdef is treated as if it were an unrecognized symbol. If the same symbol appears in more than one argument, only the first occurrence is significant.

unifdef copies its output to the standard output and will take its input from the standard input if no filename argument is given.

The following options are available:

- -c  Complement the normal operation. Lines that would have been removed or blanked are retained, and vice versa.
- -l  Replace “lines removed” lines with blank lines.
- -t  Plain text option. unifdef refrains from attempting to recognize comments and single and double quotes.
- -iDname Ignore, but print out, lines associated with the defined symbol name. If you use ifdefs to delimit non-C lines, such as comments or code which is under construction, then you must tell unifdef which symbols are used for that purpose so that it will not try to parse for quotes and comments within them.
- -iUname Ignore, but print out, lines associated with the undefined symbol name.

SEE ALSO
cc(1)

DIAGNOSTICS
Premature EOF  Inappropriate else or endif.
Exit status is 0 if output is exact copy of input, 1 if not, 2 if unifdef encounters problems.
NAME
uptime - show how long the system has been up

SYNOPSIS
/usr/ucb/uptime

DESCRIPTION
The uptime command prints the current time, the length of time the system has
been up. It is the first line of a w(1) command.

EXAMPLE
Below is an example of the output uptime provides:

```
uptime
6:47am up 6 days, 16:38, 1 users
```

SEE ALSO
w(1)

NOTES
who -b gives the time the system was last booted.
NAME
users - display a compact list of users logged in

SYNOPSIS
/usr/ucb/users [ file ]

DESCRIPTION
users lists the login names of the users currently on the system in a compact, one-line format.

Specifying file, tells users where to find its information; by default it checks /var/adm/utmp.

Typing users is equivalent to typing who -q.

EXAMPLE
users
paul george ringo

FILES
/var/adm/utmp

SEE ALSO
NAME
vacation - reply to mail automatically

SYNOPSIS
/usr/ucb/vacation [-I]
/usr/ucb/vacation [-j] [-aalias] [-tN] username

DESCRIPTION
vacation automatically replies to incoming mail. The reply is contained in the
file .vacation.msg, that you create in your home directory.

This file should include a header with at least a 'Subject:' line (it should not
include a 'From:' or a 'To:' line). For example:

    Subject: I am on vacation
    I am on vacation until July 22. If you have something urgent,
    please contact Joe Jones (jones@f40).
    --John

If the string $SUBJECT appears in the .vacation.msg file, it is replaced with the
subject of the original message when the reply is sent; thus, a .vacation.msg file
such as

    Subject: I am on vacation
    I am on vacation until July 22.
    Your mail regarding "$SUBJECT" will be read when I return.
    If you have something urgent, please contact
    Joe Jones (jones@f40).
    --John

will include the subject of the message in the reply.

No message is sent if the 'To:' or the 'Cc:' line does not list the user to whom
the original message was sent or one of a number of aliases for them, if the initial
From line includes the string -REQUEST@, or if a 'Precedence: bulk' or 'Prece-
cedence: junk' line is included in the header.

The following options are available:
-I Initialize the .vacation.pag and .vacation.dir files and start
/usr/ucb/vacation.

If the -I flag is not specified, and a user argument is given, /usr/ucb/vacation
reads the first line from the standard input (for a 'From:' line, no colon). If
absent, it produces an error message. The following options may be specified:

-aalias
Indicate that alias is one of the valid aliases for the user running
/usr/ucb/vacation, so that mail addressed to that alias generates a
reply.

-j Do not check whether the recipient appears in the 'To:' or the 'Cc:'
line.
-tN  Change the interval between repeat replies to the same sender. The default is 1 week. A trailing s, m, h, d, or w scales N to seconds, minutes, hours, days, or weeks respectively.

**USAGE**

To start `/usr/ucb/vacation`, create a `.forward` file in your home directory containing a line of the form:

```
\username, "|/usr/ucb/vacation username"
```

where `username` is your login name.

Then type in the command:

```
/usr/ucb/vacation -I
```

To stop `/usr/ucb/vacation`, remove the `.forward` file, or move it to a new name.

If `/usr/ucb/vacation` is run with no arguments, it will permit you to interactively turn `/usr/ucb/vacation` on or off. It will create a `.vacation.msg` file for you, or edit an existing one, using the editor specified by the VISUAL or EDITOR environment variable, or vi(1) if neither of those environment variables are set. If a `.forward` file is present in your home directory, it will ask whether you want to remove it and turn off `/usr/ucb/vacation`. If it is not present in your home directory, it creates it for you, and automatically performs a `'/usr/ucb/vacation -I'` function, turning on `/usr/ucb/vacation`.

**FILES**

```
~/.forward
~/.vacation.msg
```

A list of senders is kept in the files `.vacation.pag` and `.vacation.dir` in your home directory.

**SEE ALSO**

sendmail(1M).

vi(1) in the *User's Reference Manual*. 
NAME

w - who is logged in, and what are they doing

SYNOPSIS

/usr/ucb/w [-hls] [ user ]

DESCRIPTION

The w command displays a summary of the current activity on the system, including what each user is doing. The heading line shows the current time of day, how long the system has been up, and the number of users logged into the system.

The fields displayed are: the users login name, the name of the tty the user is on, the time of day the user logged on (in hours:minutes), the idle time—that is, the number of minutes since the user last typed anything (in hours:minutes), the CPU time used by all processes and their children on that terminal (in minutes:seconds), the CPU time used by the currently active processes (in minutes:seconds), the name and arguments of the current process.

If a user name is included, output is restricted to that user.

The following options are available:

-h Suppress the heading.

-l Produce a long form of output, which is the default.

-s Produce a short form of output. In the short form, the tty is abbreviated, the login time and CPU times are left off, as are the arguments to commands.

EXAMPLE

w

7:36am up 6 days, 16:45, 1 users
User tty login idle CPU PCPU what
ralph console 7:10am 1 10:05 4:31 w

FILES

/var/adm/utmp
/dev/kmem
/dev/drum

SEE ALSO


NOTES

The notion of the “current process” is muddy. The current algorithm is ‘the highest numbered process on the terminal that is not ignoring interrupts, or, if there is none, the highest numbered process on the terminal’. This fails, for example, in critical sections of programs like the shell and editor, or when faulty programs running in the background fork and fail to ignore interrupts. In cases where no process can be found, w prints −.
The CPU time is only an estimate, in particular, if someone leaves a background process running after logging out, the person currently on that terminal is "charged" with the time.

Background processes are not shown, even though they account for much of the load on the system.

Sometimes processes, typically those in the background, are printed with null or garbaged arguments. In these cases, the name of the command is printed in parentheses.

w does not know about the conventions for detecting background jobs. It will sometimes find a background job instead of the right one.
whatls(1)

NAME
whatls - display a one-line summary about a keyword

SYNOPSIS
/usr/ucb/whatls command...

DESCRIPTION
whatls looks up a given command and displays the header line from the manual section. You can then run the man(1) command to get more information. If the line starts 'name(section)..' you can do 'man section name' to get the documentation for it. Try 'whatls ed' and then you should do 'man 1 ed' to get the manual page for ed(1).

whatls is actually just the -f option to the man command.

FILES
/usr/share/man/whatis data base

SEE ALSO
man(1), catman(1M)
NAME
which - locate a command; display its pathname or alias

SYNOPSIS
/usr/ucb/which [filename] ...

DESCRIPTION
which takes a list of names and looks for the files which would be executed had these names been given as commands. Each argument is expanded if it is aliased, and searched for along the user's path. Both aliases and path are taken from the user's .cshrc file.

FILES
~/.cshrc source of aliases and path values

SEE ALSO

DIAGNOSTICS
A diagnostic is given for names which are aliased to more than a single word, or if an executable file with the argument name was not found in the path.

NOTES
Only aliases and paths from ~/.cshrc are used; importing from the current environment is not attempted.

which must be executed by csh(1), since only csh knows about aliases. If you are using sh instead of csh, whence -v provides similar functionality.

To compensate for ~/.cshrc files in which aliases depend upon the prompt variable being set, which sets this variable. If the ~/.cshrc produces output or prompts for input when prompt is set, which may produce some strange results.
whoami(1)

NAME
whoami – display the effective current username

SYNOPSIS
/usr/ucb/whoami

DESCRIPTION
whoami displays the login name corresponding to the current effective user ID. If you have used su to temporarily adopt another user, whoami will report the login name associated with that user ID. whoami gets its information from the geteuid and getpwuid library routines (see geteuid and getpwent, respectively).

FILES
/etc/passwd username data base

SEE ALSO
NAME

catman - create the cat files for the manual

SYNOPSIS

/usr/ucb/catman [ -nptw ] [ -M directory ] [ -T tmac.an ] [ sections ]

DESCRIPTION

The catman commands creates the preformatted versions of the on-line manual from the nroff(1) input files. Each manual page is examined and those whose preformatted versions are missing or out of date are recreated. If any changes are made, catman recreatesthe whatis database.

If there is one parameter not starting with a ‘-’, it is taken to be a list of manual sections to look in. For example

    catman 123

only updates manual sections 1, 2, and 3.

The following options are available:

- n    Do not (re)create the whatis database.
- p    Print what would be done instead of doing it.
- t    Create troffed entries in the appropriate fmt subdirectories instead of nroffing into the cat subdirectories.
- w    Only create the whatis database. No manual reformatting is done.
- M    Update manual pages located in the specified directory (/usr/share/man by default).
- T    Use tmac.an in place of the standard manual page macros.

ENVIRONMENT

TROFF The name of the formatter to use when the -t flag is given. If not set, 'troff' is used.

FILES

/usr/share/man                default manual directory location
/usr/share/man/man?/.*.*     raw (nroff input) manual sections
/usr/share/man/cat?/.*.*     preformatted nroffed manual pages
/usr/share/man/fmt?/.*.*     preformatted troffed manual pages
/usr/share/man/whatis        whatis database location
/usr/ucblib/makewhatis       command script to make whatis database

SEE ALSO

man(1), nroff(1), troff(1), whatis(1)

DIAGNOSTICS

man?/xxx.? (.so'ed from man?/yyy.?): No such file or directory

The file outside the parentheses is missing, and is referred to by the file inside them.

target of .so in man?/xxx.? must be relative to /usr/man
catman only allows references to filenames that are relative to the directory /usr/share/man.
opendir: No such file or directory
A harmless warning message indicating that one of the directories catman
normally looks for is missing.

*.*: No such file or directory
A harmless warning message indicating catman came across an empty
directory.
NAME
du - display the number of disk blocks used per directory or file

SYNOPSIS
/usr/ucb/du [ -F ufs ]
/usr/ucb/du [ -F ufs ] [ -a ] [ -s ] [ filename . . . ]

DESCRIPTION
du gives the number of kilobytes contained in all files and, recursively, directories
within each specified directory or file filename. If filename is missing, '.' (the
current directory) is used.
A file which has multiple links to it is only counted once.

OPTIONS
-a Generate an entry for each file.
-s Only display the grand total for each of the specified filenames.
Entries are generated only for each directory in the absence of options.

EXAMPLE
Here is an example of using du in a directory. We used the pwd(1) command to
identify the directory, then used du to show the usage of all the subdirectories in
that directory. The grand total for the directory is the last entry in the display:
% pwd
/usr/ralph/misc
% du
5     ./jokes
33    ./squash
44    ./tech.papers/lpr.document
217   ./tech.papers/new.manager
401   ./tech.papers
144   ./memos
80    ./letters
388   ./window
93    ./messages
15    ./useful.news
1211
%

SEE ALSO

NOTES
Filename arguments that are not directory names are ignored, unless you use -a.
If there are too many distinct linked files, du will count the excess files more than
once.
fastboot(1M)  fastboot(1M)

NAME
  fastboot, fasthalt - reboot/halt the system without checking the disks

SYNOPSIS
  /usr/ucb/fastboot [ boot-options ]
  /usr/ucb/fasthalt [ halt-options ]

DESCRIPTION
  fastboot and fasthalt are shell scripts that invoke reboot and halt with the
  proper arguments.
  These commands are provided for compatibility only.

FILES
  /etc/rc

SEE ALSO
  halt(1M), reboot(1M).
  fsck(1M), init(1M), rc0(1M), rc2(1M), rc6(1M) in the System Administrator's
NAME
grpck - check group database entries

SYNOPSIS
/usr/ucb/grpck [ filename ]

DESCRIPTION
grpck checks that a file in group(4) does not contain any errors; it checks the
/etc/group file by default.
This command differs from /usr/sbin/grpck in its ability to correctly parse YP
entries in /etc/passwd.

FILES
/etc/group

SEE ALSO

DIAGNOSTICS
Too many/few fields
An entry in the group file does not have the proper number of fields.

No group name
The group name field of an entry is empty.

Bad character(s) in group name
The group name in an entry contains characters other than lower-case
letters and digits.

Invalid GID
The group ID field in an entry is not numeric or is greater than 65535.

Null login name
A login name in the list of login names in an entry is null.

Login name not found in password file
A login name in the list of login names in an entry is not in the password
file.
NAME
halt - stop the processor

SYNOPSIS
/usr/ucb/halt [ -nqy ]

DESCRIPTION
halt writes out any information pending to the disks and then stops the processor.

halt normally logs the system shutdown to the system log daemon, syslogd(1M), and places a shutdown record in the login accounting file /var/adm/wtmp. These actions are inhibited if the -n or -q options are present.

The following options are available:
-n Prevent the sync before stopping.
-q Quick halt. No graceful shutdown is attempted.
-y Halt the system, even from a dialup terminal.

FILES
/var/adm/wtmp login accounting file

SEE ALSO
reboot(1M), syslogd(1M)

NOTES
This command is equivalent to init 0.
NAME
lpc - line printer control program

SYNOPSIS
/usr/ucb/lpc [ command [ parameter ... ] ]

DESCRIPTION
lpc controls the operation of the printer, or of multiple printers. lpc commands
can be used to start or stop a printer, disable or enable a printer's spooling
queue, rearrange the order of jobs in a queue, or display the status of each
printer—along with its spooling queue and printer daemon.

With no arguments, lpc runs interactively, prompting with 'lpc>'. If arguments
are supplied, lpc interprets the first as a command to execute; each subsequent
argument is taken as a parameter for that command. The standard input can be
redirected so that lpc reads commands from a file.

Commands may be abbreviated to an unambiguous substring. Note: the printer
parameter is specified just by the name of the printer (as lw), not as you would
specify it to lpr(1) or lpq(1) (not as -P lw).

? [command]...
help [command]...
Display a short description of each command specified in the argument
list, or, if no arguments are given, a list of the recognized commands.

abort [all] [printer ...]
Terminate an active spooling daemon on the local host immediately and
then disable printing (preventing new daemons from being started by
lpr(1)) for the specified printers. The abort command can only be used
by the privileged user.

clean [all] [printer ...]
Remove all files created in the spool directory by the daemon from the
specified printer queue(s) on the local machine. The clean command can
only be used by the privileged user.

disable [all] [printer ...]
Turn the specified printer queues off. This prevents new printer jobs from
being entered into the queue by lpr(1). The disable command can only
be used by the privileged user.

down [all] [printer ...] [message]
Turn the specified printer queue off, disable printing and put message in
the printer status file. The message does not need to be quoted, the
remaining arguments are treated like echo(1). This is normally used to
take a printer down and let others know why (lpq(1) indicates that the
printer is down, as does the status command).

enable [all] [printer ...]
Enable spooling on the local queue for the listed printers, so that lpr(1)
can put new jobs in the spool queue. The enable command can only be
used by the privileged user.
exit
quit  Exit from lpc.
restart [all | [printer ...]]
      Attempt to start a new printer daemon. This is useful when some abnor-
      mal condition causes the daemon to die unexpectedly leaving jobs in the
      queue. This command can be run by any user.
start [all | [printer ...]]
      Enable printing and start a spooling daemon for the listed printers. The
      start command can only be used by the privileged user.
status [all | [printer ...]]
      Display the status of daemons and queues on the local machine. This
      command can be run by any user.
stop [all | [printer ...]]
      Stop a spooling daemon after the current job completes and disable print-
      ing. The stop command can only be used by the privileged user.
topq printer [job# ...] [user ...]
      Move the print job(s) specified by job# or those job(s) belonging to user to
      the top (head) of the printer queue. The topq command can only be used
      by the privileged user.
up [all | [printer ...]]
      Enable everything and start a new printer daemon.
      Undoes the effects of down.

FILES
/var/spool/lp/*
/var/spool/lp/system/pstatus

SEE ALSO
lpq(1), lpr(1), lprm(1)

DIAGNOSTICS
?Ambiguous command
      The abbreviation you typed matches more than one command.
?Invalid command
      You typed a command or abbreviation that was not recognized.
?Privileged command
      You used a command can be executed only by the privileged user.
lpc: printer: unknown printer to the print service
      The printer was not found in the System V LP database. Usually this is
      a typing mistake; however, it may indicate that the printer does not exist
      on the system. Use 'lptstat -p' to find the reason.
lpc: error on opening queue to spooler
      The connection to lpsched on the local machine failed. This usually
      means the printer server started at boot time has died or is hung. Check
      if the printer spooler daemon /usr/lib/lp/lpsched is running.
lpc: Can't send message to LP print service
lpc: Can't receive message from LP print service
These indicate that the LP print service has been stopped. Get help from the system administrator.

lpc: Received unexpected message from LP print service
It is likely there is an error in this software. Get help from system administrator.
mailstats(1M)

NAME
mailstats - print statistics collected by sendmail

SYNOPSIS
/usr/ucb/mailstats [ filename ]

DESCRIPTION
mailstats prints out the statistics collected by the sendmail program on mailer usage. These statistics are collected if the file indicated by the \$ configuration option of sendmail exists. mailstats first prints the time that the statistics file was created and the last time it was modified. It will then print a table with one row for each mailer specified in the configuration file. The first column is the mailer number, followed by the symbolic name of the mailer. The next two columns refer to the number of messages received by sendmail, and the last two columns refer to messages sent by sendmail. The number of messages and their total size (in 1024 byte units) is given. No numbers are printed if no messages were sent (or received) for any mailer.

You might want to add an entry to /var/spool/cron/crontab/root to reinitialize the statistics file once a night. Copy /dev/null into the statistics file or otherwise truncate it to reset the counters.

FILES
/var/spool/cron/crontab/root
/dev/null

SEE ALSO
sendmail(1M).

NOTES
mailstats should read the configuration file instead of having a hard-wired table mapping mailer numbers to names.
NAME
newaliases - rebuild the data base for the mail aliases file

SYNOPSIS
/usr/ucb/newaliases

DESCRIPTION
newaliases rebuilds the random access data base for the mail aliases file
/etc/aliases. It is run automatically by sendmail(1M) (in the default
configuration) whenever a message is sent.

FILES
/etc/aliases

SEE ALSO
sendmail(1M), aliases(4).
newfs(1M)

NAME
newfs - construct a new file system

SYNOPSIS
/usr/ucb/newfs [ -nNv ] [ mkfs-options ] block-special-file

DESCRIPTION
newfs is a friendly front-end to the mkfs(1M) program. On Sun systems, the disk
type is determined by reading the disk label for the specified block-special-file.
block-special-file is the name of a block special device residing in /dev. If you
want to make a file system on sd0, you can specify sd0 rsd0 or /dev/rsd0; if
you only specify sd0, newfs will find the proper device.

newfs then calculates the appropriate parameters to use in calling mkfs, builds
the file system by forking mkfs and, if the file system is a root partition, installs
the necessary bootstrap programs in its initial 16 sectors.

OPTIONS
- n  Do not install the bootstrap programs.
- N  Print out the file system parameters without actually creating the file sys-
    tem.
- v  Verbose. newfs prints out its actions, including the parameters passed to
    mkfs.

mkfs-options
Options that override the default parameters passed to mkfs(1M) are:
- b  block-size
   The block size of the file system in bytes.
- c  #cylinders/group
   The number of cylinders per cylinder group in a file system. The
default value used is 16.
- d  rotdelay
   This specifies the expected time (in milliseconds) to service a
   transfer completion interrupt and initiate a new transfer on the
   same disk. It is used to decide how much rotational spacing to
   place between successive blocks in a file.
- f  frag-size
   The fragment size of the file system in bytes.
- i  bytes/inode
   This specifies the density of inodes in the file system. The default
   is to create an inode for each 2048 bytes of data space. If fewer
   inodes are desired, a larger number should be used; to create more
   inodes a smaller number should be given.
- m  free-space%
   The percentage of space reserved from normal users; the minimum
   free space threshold. The default value used is 10%.
-o optimization
(space or time). The file system can either be instructed to try to
minimize the time spent allocating blocks, or to try to minimize the
space fragmentation on the disk. If the minimum free space thresh­
hold (as specified by the -m option) is less than 10%, the default is
to optimize for space; if the minimum free space threshold is
greater than or equal to 10%, the default is to optimize for time.

-r revolutions/minute
The speed of the disk in revolutions per minute (normally 3600).

-s size
The size of the file system in sectors.

-t #tracks/cylinder
The number of tracks per cylinders on the disk.

FILES
/usr/mdec for boot strapping programs
/dev

SEE ALSO
fsck(1M), mkfs(1M), tunefs(1M), fs(4) in the System Administrator's Reference
Manual.
NAME
pwck - check password database entries

SYNOPSIS
/usr/ucb/pwck [ filename ]

DESCRIPTION
pwck checks a password file for errors. If specified, filename is checked, otherwise
/etc/passwd is checked.
This command differs from /usr/sbin/pwck in its ability to correctly parse YP
entries in /etc/ passwd.

DIAGNOSTICS
Too many/few fields
An entry in the password file does not have the proper number of fields.

No login name
The login name field of an entry is empty.

Bad character(s) in login name
The login name in an entry contains characters other than lower-case
letters and digits.

First char in login name not lower case alpha
The login name in an entry does not begin with a lower-case letter.

Login name too long
The login name in an entry has more than 8 characters.

Invalid UID
The user ID field in an entry is not numeric or is greater than 65535.

Invalid GID
The group ID field in an entry is not numeric or is greater than 65535.

No login directory
The login directory field in an entry is empty.

Login directory not found
The login directory field in an entry refers to a directory that does not
exist.

Optional shell file not found.
The login shell field in an entry refers to a program or shell script that
does not exist.

No netgroup name
The entry is a Yellow Pages entry referring to a netgroup, but no netgroup
is present.

Bad character(s) in netgroup name
The netgroup name in a Yellow Pages entry contains characters other than
lower-case letters and digits.

First char in netgroup name not lower case alpha
The netgroup name in a Yellow pages entry does not begin with a lower-
case letter.
pwck(1M)

FILES
    /etc/passwd

SEE ALSO
reboot(1M)

NAME
reboot - restart the operating system

SYNOPSIS
/usr/ucb/reboot [ -dnq ] [ boot arguments ]

DESCRIPTION
reboot restarts the kernel. The kernel is loaded into memory by the PROM monitor, which transfers control to it.

Although reboot can be run by the privileged user at any time, shutdown(1M) is normally used first to warn all users logged in of the impending loss of service. See shutdown(1M) for details.

reboot performs a sync(1) operation on the disks, and then a multiuser reboot is initiated. See init(1M) for details.

reboot normally logs the reboot to the system log daemon, syslogd(1M), and places a shutdown record in the login accounting file /var/adm/wtmp. These actions are inhibited if the -n or -q options are present.

The following options are available:
-d Dump system core before rebooting. This option is provided for compatibility, but is not supported by the underlying reboot(3) call.
-n Avoid the sync(1). It can be used if a disk or the processor is on fire.
-q Quick. Reboots quickly and ungracefully, without first shutting down running processes.

boot arguments
These arguments are accepted for compatibility, but are ignored by reboot. See boot(1M) for details.

Power Fail and Crash Recovery
Normally, the system will reboot itself at power-up or after crashes.

FILES
/var/adm/wtmp login accounting file

SEE ALSO
halt(1M), syslogd(1M), reboot(3).
boot(8), crash(1M), fsck(1M), init(1M), shutdown(1M), sync(1M), in the System Administrator's Reference Manual.
renice(1M)

NAME
renice - alter priority of running processes

SYNOPSIS
/usr/ucb/renice priority pid ...
/usr/ucb/renice priority [-p pid ...] [-g pgrp ...] [-u username ...]

DESCRIPTION
The renice command alters the scheduling priority of one or more running
processes. By default, the processes to be affected are specified by their process
IDs. priority is the new priority value.

The following options are available:
-p pid ... Specify a list of process IDs.
-g pgrp ... Specify a list of process group IDs. The processes in the specified
       process groups have their scheduling priority altered.
-u user ... Specify a list of user IDs or usernames. All processes owned by each
user have their scheduling altered.

Users other than the privileged user may only alter the priority of processes they
own, and can only monotonically increase their nice value within the range 0 to
20. This prevents overriding administrative fiat. The privileged user may alter
the priority of any process and set the priority to any value in the range -20 to
20. Useful priorities are: 19 (the affected processes will run only when nothing
else in the system wants to), 0 (the base scheduling priority) and any negative
value (to make things go very fast).

If only the priority is specified, the current process (alternatively, process group
or user) is used.

FILES
/etc/passwd map user names to user ID’s

SEE ALSO

NOTES
If you make the priority very negative, then the process cannot be interrupted.
To regain control you must make the priority greater than zero.

Users other than the privileged user cannot increase scheduling priorities of their
own processes, even if they were the ones that decreased the priorities in the first
place.

The priocntl command subsumes the function of renice.
NAME
 sendmail - send mail over the internet

SYNOPSIS
 /usr/ucb/sendmail [ -ba ] [ -bd ] [ -bi ] [ -bm ] [ -bp ] [ -bs ] [ -bt ] [ -bv ]
  [ -bz ] [ -Cfile ] [ -dX ] [ -Ffullname ] [ -fname ] [ -hN ] [ -n ] [ -o xvalue ]
  [ -q[ time ] ] [ -rname ] [ -t ] [ -v ] [ address ... ]

DESCRIPTION
 sendmail sends a message to one or more people, routing the message over
whatever networks are necessary. sendmail does internetwork forwarding as
necessary to deliver the message to the correct place.

sendmail is not intended as a user interface routine; other programs provide
user-friendly front ends; sendmail is used only to deliver pre-formatted mes-
sages.

With no flags, sendmail reads its standard input up to an EOF, or a line with a
single dot and sends a copy of the letter found there to all of the addresses listed.
It determines the network to use based on the syntax and contents of the
addresses.

Local addresses are looked up in the local aliases(4) file, or by using the YP
name service, and aliased appropriately. In addition, if there is a .forward file in
a recipient's home directory, sendmail forwards a copy of each message to the
list of recipients that file contains. Aliasing can be prevented by preceding the
address with a backslash. Normally the sender is not included in alias expan-
sions, for example, if 'john' sends to 'group', and 'group' includes 'john' in the
expansion, then the letter will not be delivered to 'john'.

sendmail will also route mail directly to other known hosts in a local network.
The list of hosts to which mail is directly sent is maintained in the file
/usr/lib/mailhosts.

The following options are available:

- ba  Go into ARPANET mode. All input lines must end with a CR-LF, and all
  messages will be generated with a CR-LF at the end. Also, the 'From:' and
  "Sender:" fields are examined for the name of the sender.

- bd  Run as a daemon, waiting for incoming SMTP connections.

- bi  Initialize the alias database.

- bm  Deliver mail in the usual way (default).

- bp  Print a summary of the mail queue.

- bs  Use the SMTP protocol as described in RFC 821. This flag implies all the
  operations of the -ba flag that are compatible with SMTP.

- bt  Run in address test mode. This mode reads addresses and shows the
  steps in parsing; it is used for debugging configuration tables.

- bv  Verify names only — do not try to collect or deliver a message. Verify
  mode is normally used for validating users or mailing lists.
-bz Create the configuration freeze file.
-cfile Use alternate configuration file.
-dX Set debugging value to X.
-Efull Set the full name of the sender.
-Ename Sets the name of the "from" person (that is, the sender of the mail). -e can only be used by "trusted" users (who are listed in the config file).
-hN Set the hop count to N. The hop count is incremented every time the mail is processed. When it reaches a limit, the mail is returned with an error message, the victim of an aliasing loop.
-Mid Attempt to deliver the queued message with message-id id.
-n Do not do aliasing.
-ox value Set option x to the specified value. Options are described below.
-q[time] Processed saved messages in the queue at given intervals. If time is omitted, process the queue once. Time is given as a tagged number, with s being seconds, m being minutes, h being hours, d being days, and w being weeks. For example, -q1h30m or -q90m would both set the timeout to one hour thirty minutes.
-rname An alternate and obsolete form of the -f flag.
-Rstring Go through the queue of pending mail and attempt to deliver any message with a recipient containing the specified string. This is useful for clearing out mail directed to a machine which has been down for awhile.
-t Read message for recipients. "To:", "Cc:," and "Bcc:" lines will be scanned for people to send to. The "Bcc:" line will be deleted before transmission. Any addresses in the argument list will be suppressed.
-v Go into verbose mode. Alias expansions will be announced, etc.

PROCESSING OPTIONS
There are also a number of processing options that may be set. Normally these will only be used by a system administrator. Options may be set either on the command line using the -o flag or in the configuration file. The options are:

Afile Use alternate alias file.
c On mailers that are considered "expensive" to connect to, do not initiate immediate connection. This requires queueing.
dx Set the delivery mode to x. Delivery modes are i for interactive (synchronous) delivery, b for background (asynchronous) delivery, and q for queue only — that is, actual delivery is done the next time the queue is run.
Run `newaliases(1M)` to automatically rebuild the alias database, if necessary.

Set error processing to mode `x`. Valid modes are `m` to mail back the error message, `w` to "write" back the error message (or mail it back if the sender is not logged in), `p` to print the errors on the terminal (default), ‘q’ to throw away error messages (only exit status is returned), and ‘e’ to do special processing for the BerkNet. If the text of the message is not mailed back by modes `m` or `w` and if the sender is local to this machine, a copy of the message is appended to the file `dead.letter` in the sender’s home directory.

The mode to use when creating temporary files.

Save UNIX-system-style “From” lines at the front of messages.

The default group ID to use when calling mailers.

The SMTP help file.

Do not take dots on a line by themselves as a message terminator.

The log level.

Send to "me" (the sender) also if I am in an alias expansion.

If set, this message may have old style headers. If not set, this message is guaranteed to have new style headers (that is, commas instead of spaces between addresses). If set, an adaptive algorithm is used that will correctly determine the header format in most cases.

Select the directory in which to queue messages.

The timeout on reads; if none is set, `sendmail` will wait forever for a mailer.

Save statistics in the named file.

Always instantiate the queue file, even under circumstances where it is not strictly necessary.

Set the timeout on messages in the queue to the specified time. After sitting in the queue for this amount of time, they will be returned to the sender. The default is three days.

Set the name of the time zone.

Set the default user id for mailers.

If the first character of the user name is a vertical bar, the rest of the user name is used as the name of a program to pipe the mail to. It may be necessary to quote the name of the user to keep `sendmail` from suppressing the blanks from between arguments.
sendmail returns an exit status describing what it did. The codes are defined in <sysexits.h>

- EX_OK: Successful completion on all addresses.
- EX_NOUSER: User name not recognized.
- EX_UNAVAILABLE: Catchall meaning necessary resources were not available.
- EX_SYNTAX: Syntax error in address.
- EX_SOFTWARE: Internal software error, including bad arguments.
- EX_OSERR: Temporary operating system error, such as cannot fork.
- EX_NOHOST: Host name not recognized.
- EX_TEMPFAIL: Message could not be sent immediately, but was queued.

If invoked as newaliases, sendmail rebuilds the alias database. If invoked as mailq, sendmail prints the contents of the mail queue.

FILES

Except for /etc/sendmail.cf, these pathnames are all specified in /etc/sendmail.cf. Thus, these values are only approximations.

- /usr/bin/uux: to deliver uucp mail
- /usr/bin/mail: to deliver local mail
- /var/spool/mqueue/*: temp files and queued mail
- ~/.forward: list of recipients for forwarding messages

SEE ALSO

biff(1), aliases(4).


shutdown (1M)

NAME
shutdown - close down the system at a given time

SYNOPSIS
/usr/ucb/shutdown [ -fhknr ] [ time [ warning-message ... ]]

DESCRIPTION
shutdown provides an automated procedure to notify users when the system is to
be shut down. time specifies when shutdown will bring the system down; it may
be the word now (indicating an immediate shutdown), or it may specify a future
time in one of two formats: +number and hour:min. The first form brings the sys­
tem down in number minutes, and the second brings the system down at the time
of day indicated in 24-hour notation.

At intervals that get closer as the apocalypse approaches, warning messages are
displayed at terminals of all logged-in users, and of users who have remote
mounts on that machine. Five minutes before shutdown, or immediately if shut­
down is in less than 5 minutes, logins are disabled by creating /etc/nologin and
writing a message there. If this file exists when a user attempts to log in, login(1M) prints its contents and exits. The file is removed just before shutdown
exits.

At shutdown time a message is written to the system log daemon, syslogd(1M),
containing the time of shutdown, the instigator of the shutdown, and the reason.
Then a terminate signal is sent to init, which brings the system down to single­
user mode.

The time of the shutdown and the warning message are placed in /etc/nologin,
which should be used to inform the users as to when the system will be back up,
and why it is going down (or anything else).

OPTIONS
As an alternative to the above procedure, these options can be specified:
-f Arrange, in the manner of fastboot(1M), that when the system is
rebooted, the file systems will not be checked.
-h Execute halt(1M).
-k Simulate shutdown of the system. Do not actually shut down the system.
-n Prevent the normal sync(2) before stopping.
-r Execute reboot(1M).

FILES
/etc/nologin tells login not to let anyone log in
/etc/xtab list of remote hosts that have mounted this host

SEE ALSO
fastboot(1M), halt(1M), reboot(1M), syslogd(1M).

NOTES

Only allows you to bring the system down between now and 23:59 if you use the absolute time for shutdown.
syslogd(1M)

NAME
syslogd - log system messages

SYNOPSIS
/usr/ucb/syslogd [-d] [-f configfile] [-m interval]

DESCRIPTION
syslogd reads and forwards system messages to the appropriate log files and/or
users, depending upon the priority of a message and the system facility from
which it originates. The configuration file /etc/syslog.conf [see
syslog.conf(5)] controls where messages are forwarded. syslogd logs a mark
(timestamp) message every interval minutes (default 20) at priority LOG_INFO to
the facility whose name is given as mark in the syslog.conf file.

A system message consists of a single line of text, which may be prefixed with a
priority code number enclosed in angle-brackets (<>); priorities are defined in
sys/syslog.h.

syslogd reads from the STREAMS log driver, /dev/log, from any transport pro-
vider specified in /etc/netconfig, /etc/net/transport/hosts, and
/etc/net/transport/services, and from the special device /dev/klog (for kernel
messages).

syslogd reads the configuration file when it starts up, and again whenever it re-
ceives a HUP signal, at which time it also closes all files it has open, re-reads its
configuration file, and then opens only the log files that are listed in that file.
syslogd exits when it receives a TERM signal.

As it starts up, syslogd creates the file /etc/syslog.pid, if possible, containing
its process ID (PID).

The following options are available:
-d Turn on debugging.
-f configfile Specify an alternate configuration file.
-m interval Specify an interval, in minutes, between mark messages.

FILES
/etc/syslog.conf configuration file
/etc/syslog.pid process ID
/dev/log STREAMS log driver
/etc/netconfig specifies the transport providers available on the system
/etc/net/transport/hosts network hosts for each transport
/etc/net/transport/services network services for each transport

SEE ALSO
logger(1), syslog(3), syslog.conf(5)

NAME
alloca - memory allocator

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <alloca.h>
char *alloca(size)
int size;

DESCRIPTION
alloca allocates size bytes of space in the stack frame of the caller, and returns a
pointer to the allocated block. This temporary space is automatically freed when
the caller returns. Note: if the allocated block is beyond the current stack limit,
the resulting behavior is undefined.

SEE ALSO
sigstack(3), sigvec(3).
ld(1), brk(2), getrlimit(2), calloc(3), and malloc(3) in the Programmer's Refer­
ence Manual.

Stephenson, C.J., Fast Fits, in Proceedings of the ACM 9th Symposium on Operating

NOTES
alloca is machine-, compiler-, and most of all, system-dependent. Its use is
strongly discouraged.
NAME
bstring: bcopy, bcnp, bzero, ffs - bit and byte string operations

SYNOPSIS
cc [ flag... ] file ... -lucb
bcopy(b1, b2, length)
char *b1, *b2;
int length;
int bcnp (b1, b2, length)
char *b1, *b2;
int length;
bzero(b, length)
char *b;
int length;

DESCRIPTION
The functions bcopy, bcnp, and bzero operate on variable length strings of bytes. They do not check for null bytes as the routines in string(3) do.
bcopy copies length bytes from string b1 to the string b2. Overlapping strings are handled correctly.
bcnp compares byte string b1 against byte string b2, returning zero if they are identical, 1 otherwise. Both strings are assumed to be length bytes long. bcnp of length zero bytes always returns zero.
bzero places length 0 bytes in the string b.

CAVEAT
The bcnp and bcopy routines take parameters backwards from strcmp and strcpy.

SEE ALSO
string(3C) in the Programmer’s Reference Manual.
NAME
dbm: dbminit, dbmclose, fetch, store, delete, firstkey, nextkey – data base subroutines

SYNOPSIS
cc [ flag... ] file ... -ldbm
#include <dbm.h>
typedef struct {
  char *dptr;
  int dsize;
} datum;
dbminit(file)
  char *file;
dbmclose
datum fetch(key)
datum key;
store(key, content)
datum key, content;
delete(key)
datum key;
datum firstkey
datum nextkey(key)
datum key;

DESCRIPTION
Note: the dbm library has been superseded by ndbm(3), and is now implemented using ndbm.

These functions maintain key/content pairs in a data base. The functions will handle very large (a billion blocks) databases and will access a keyed item in one or two file system accesses. The functions are obtained with the loader option -ldbm.

d is a string of dsize bytes pointed to by dptr. Arbitrary binary data, as well as normal ASCII strings, are allowed. The data base is stored in two files. One file is a directory containing a bit map and has .dir as its suffix. The second file contains all data and has .pag as its suffix.

Before a database can be accessed, it must be opened by dbminit. At the time of this call, the files file.dir and file.pag must exist. An empty database is created by creating zero-length .dir and .pag files.

A database may be closed by calling dbmclose. You must close a database before opening a new one.

Once open, the data stored under a key is accessed by fetch and data is placed under a key by store. A key (and its associated contents) is deleted by delete. A linear pass through all keys in a database may be made, in an (apparently) random order, by use of firstkey and nextkey. firstkey will return the first key
in the database. With any key nextkey will return the next key in the database.
This code will traverse the data base:

```
for (key = firstkey; key.dptr != NULL; key = nextkey(key))
```

SEE ALSO

ndbm(3).

RETURN VALUE

All functions that return an int indicate errors with negative values. A zero
return indicates no error. Routines that return a datum indicate errors with a
NULL (0) dptr.

NOTES

The .pag file will contain holes so that its apparent size is about four times its
actual content. Older versions of the UNIX operating system may create real file
blocks for these holes when touched. These files cannot be copied by normal
means (cp(1), cat(1), tar(1), ar(1)) without filling in the holes.

dptr pointers returned by these subroutines point into static storage that is
changed by subsequent calls.

The sum of the sizes of a key/content pair must not exceed the internal block size
(currently 1024 bytes). Moreover all key/content pairs that hash together must fit
on a single block. store will return an error in the event that a disk block fills
with inseparable data.

delete does not physically reclaim file space, although it does make it available
for reuse.

The order of keys presented by firstkey and nextkey depends on a hashing
function, not on anything interesting.

There are no interlocks and no reliable cache flushing; thus concurrent updating
and reading is risky.
NAME
decimal_to_floating: decimal_to_single, decimal_to_double, decimal_to_extended - convert decimal record to floating-point value

SYNOPSIS
c
cc [ flag... ] file ... -lucb
#include <floatingpoint.h>
void decimal_to_single(px, pm, pd, ps)
single *px;
decimal_mode *pm;
decimal_record *pd;
fp_exception_field_type *ps;
void decimal_to_double(px, pm, pd, ps)
double *px;
decimal_mode *pm;
decimal_record *pd;
fp_exception_field_type *ps;
void decimal_to_extended(px, pm, pd, ps)
extended *px;
decimal_mode *pm;
decimal_record *pd;
fp_exception_field_type *ps;

DESCRIPTION
The decimal_to_floating functions convert the decimal record at *pd into a floating-point value at *px, observing the modes specified in *pm and setting exceptions in *ps. If there are no IEEE exceptions, *ps will be zero.

pd->sign and pd->fpclass are always taken into account. pd->exponent and pd->ds are used when pd->fpclass is fp_normal or fp_subnormal. In these cases pd->ds must contain one or more ASCII digits followed by a NULL. *px is set to a correctly rounded approximation to

(pd->sign) * (pd->ds) * 10 ** (pd->exponent)

Thus if pd->exponent == -2 and pd->ds == "1234", *px will get 12.34 rounded to storage precision. pd->ds cannot have more than DECIMAL_STRING_LENGTH-1 significant digits because one character is used to terminate the string with a NULL. If pd->more!=0 on input then additional nonzero digits follow those in pd->ds; fp_inexact is set accordingly on output in *ps.

*px is correctly rounded according to the IEEE rounding modes in pm->rd.*ps is set to contain fp_inexact, fp_underflow, or fp_overflow if any of these arise.
pd->ndigits, pm->df, and pm->ndigits are not used.

strtol(3C), scanf(3S), fscanf(), and sscanf() all use decimal_to_double.

SEE ALSO
scanf(3S), strtol(3C) in the Programmer's Reference Manual.
NAME
econvert, fconvert, gconvert, seconvert, sfconvert, sgconvert - output conversion

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <floatingpoint.h>
char *econvert(value, ndigit, decpt, sign, buf)
double value;
int ndigit, *decpt, *sign;
char *buf;
char *fconvert(value, ndigit, decpt, sign, buf)
double value;
int ndigit, *decpt, *sign;
char *buf;
char *gconvert(value, ndigit, trailing, buf)
double value;
int ndigit;
int trailing;
char *buf;
char *seconvert(value, ndigit, decpt, sign, buf)
single *value;
int ndigit, *decpt, *sign;
char *buf;
char *sfconvert(value, ndigit, decpt, sign, buf)
single *value;
int ndigit, *decpt, *sign;
char *buf;
char *sgconvert(value, ndigit, trailing, buf)
single *value;
int ndigit;
int trailing;
char *buf;

DESCRIPTION
econvert converts the value to a NULL-terminated string of ndigit ASCII digits in buf and returns a pointer to buf. buf should contain at least ndigit+1 characters. The position of the decimal point relative to the beginning of the string is stored indirectly through decpt. Thus buf = "314" and *decpt == 1 corresponds to the numerical value 3.14, while buf = "314" and *decpt == -1 corresponds to the numerical value .0314. If the sign of the result is negative, the word pointed to by sign is nonzero; otherwise it is zero. The least significant digit is rounded.
fconvert works much like econvert, except that the correct digit has been rounded as if for sprintf(%w.nf) output with n=ndigit digits to the right of the decimal point. ndigit can be negative to indicate rounding to the left of the decimal point. The return value is a pointer to buf. buf should contain at least 310+max(0,ndigit) characters to accomodate any double-precision value.
gconvert converts the value to a NULL-terminated ASCII string in buf and returns a pointer to buf. It produces ndigit significant digits in fixed-decimal format, like sprintf(%w.nf), if possible, and otherwise in floating-decimal format, like sprintf(%w.ne); in either case buf is ready for printing, with sign and exponent. The result corresponds to that obtained by

    (void) sprintf(buf, "\%w.ng", value);

If trailing=0, trailing zeros and a trailing point are suppressed, as in sprintf(%g). If trailing!=0, trailing zeros and a trailing point are retained, as in sprintf(%#g).

seconvert, sfconvert, and sgconvert are single-precision versions of these functions, and are more efficient than the corresponding double-precision versions. A pointer rather than the value itself is passed to avoid C's usual conversion of single-precision arguments to double.

IEEE Infinities and NaNs are treated similarly by these functions. "NaN" is returned for NaN, and "Inf" or "Infinity" for Infinity. The longer form is produced when ndigit ≥ 8.

SEE ALSO

NAME
floating_to_decimal: single_to_decimal, double_to_decimal,
extended_to_decimal — convert floating-point value to decimal record

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <floatingpoint.h>
void single_to_decimal(px, pm, pd, ps)
single *px;
decimal_mode *pm;
decimal_record *pd;
fp_exception_field_type *ps;
void double_to_decimal(px, pm, pd, ps)
double *px;
decimal_mode *pm;
decimal_record *pd;
fp_exception_field_type *ps;
void extended_to_decimal(px, pm, pd, ps)
extended *px;
decimal_mode *pm;
decimal_record *pd;
fp_exception_field_type *ps;

DESCRIPTION
The floating_to_decimal functions convert the floating-point value at *px into
a decimal record at *pd, observing the modes specified in *pm and setting excep-
tions in *ps. If there are no IEEE exceptions, *ps will be zero.
If *px is zero, infinity, or NaN, then only pd->sign and pd->fpclass are set. Other-
wise pd->exponent and pd->ds are also set so that

(pd->sign) * (pd->ds) * 10**(pd->exponent)

is a correctly rounded approximation to *px. pd->ds has at least one and no more
than DECIMAL_STRING_LENGTH-1 significant digits because one character is used to
terminate the string with a NULL.

pd->ds is correctly rounded according to the IEEE rounding modes in pm->rd. *ps
has fp_inexact set if the result was inexact, and has fp_overflow set if the string
result does not fit in pd->ds because of the limitation DECIMAL_STRING_LENGTH.
If pm->df==floating_form, then pd->ds always contains pm->ndigits significant
digits. Thus if *px == 12.34 and pm->ndigits == 8, then pd->ds will contain
123400000 and pd->exponent will contain -6.
If pm->df==fixed_form and pm->ndigits > 0, then pd->ds always contains pm-
>ndigits after the point and as many digits as necessary before the point. Since
the latter is not known in advance, the total number of digits required is returned
in pd->ndigits; if that number >= DECIMAL_STRING_LENGTH, then ds is undefined.
pd->exponent always gets -pm->ndigits. Thus if *px == 12.34 and pm->ndigits == 1,
then pd->ds gets 123, pd->exponent gets -1, and pd->ndigits gets 3.
If `pm->df == fixed_form` and `pm->ndigits < 0`, then `pm->ds` always contains `-pm->ndigits` trailing zeros; in other words, rounding occurs `-pm->ndigits` to the left of the decimal point, but the digits rounded away are retained as zeros. The total number of digits required is in `pd->ndigits`. `pd->exponent` always gets 0. Thus if `*px == 12.34` and `pm->ndigits == -1`, then `pd->ds` gets 10, `pd->exponent` gets 0, and `pd->ndigits` gets 2.

`pd->more` is not used.

`econvert(3), fconvert, gconvert, printf(3S), and sprintf, all use double_to_decimal.`

**SEE ALSO**
NAME
floatingpoint - IEEE floating point definitions

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <sys/ieeefp.h>
#include <fp.h>

DESCRIPTION
This file defines constants, types, variables, and functions used to implement standard floating point according to ANSI/IEEE Std 754-1985. The variables and functions are implemented in libucb.a. The included file <sys/ieeefp.h> defines certain types of interest to the kernel.

IEEE Rounding Modes:

fp_direction_type The type of the IEEE rounding direction mode. Note: the order of enumeration varies according to hardware.

fp_direction The IEEE rounding direction mode currently in force. This is a global variable that is intended to reflect the hardware state, so it should only be written indirectly through a function that also sets the hardware state.

fp_precision_type The type of the IEEE rounding precision mode, which only applies on systems that support extended precision.

fp_precision The IEEE rounding precision mode currently in force. This is a global variable that is intended to reflect the hardware state on systems with extended precision, so it should only be written indirectly.

SIGFPE handling:
sigfpe_code_type The type of a SIGFPE code.
sigfpe_handler_type The type of a user-definable SIGFPE exception handler called to handle a particular SIGFPE code.

SIGFPE_DEFAULT A macro indicating the default SIGFPE exception handling, namely to perform the exception handling specified by calls to ieee_handler(3M), if any, and otherwise to dump core using abort(3).

SIGFPE_IGNORE A macro indicating an alternate SIGFPE exception handling, namely to ignore and continue execution.

SIGFPE_ABORT A macro indicating an alternate SIGFPE exception handling, namely to abort with a core dump.

IEEE Exception Handling:
N_IEEE_EXCEPTION The number of distinct IEEE floating-point exceptions.
floatingpoint(3)

fp_exception_type  The type of the N_IEEE_EXCEPTION exceptions. Each exception is given a bit number.

fp_exception_field_type  
  The type intended to hold at least N_IEEE_EXCEPTION bits corresponding to the IEEE exceptions numbered by fp_exception_type. Thus fp_inexact corresponds to the least significant bit and fp_invalid to the fifth least significant bit. Note: some operations may set more than one exception.

fp_accrued_exceptions  
  The IEEE exceptions between the time this global variable was last cleared, and the last time a function was called to update the variable by obtaining the hardware state.

ieee_handlers  
  An array of user-specifiable signal handlers for use by the standard SIGFPE handler for IEEE arithmetic-related SIGFPE codes. Since IEEE trapping modes correspond to hardware modes, elements of this array should only be modified with a function like ieee_handler(3M) that performs the appropriate hardware mode update. If no sigfpe_handler has been declared for a particular IEEE-related SIGFPE code, then the related ieee_handlers will be invoked.

IEEE Formats and Classification:

single; extended  
  Definitions of IEEE formats.

fp_class_type  
  An enumeration of the various classes of IEEE values and symbols.

IEEE Base Conversion:

The functions described under floating_to_decimal(3) and decimal_to_floating(3) not only satisfy the IEEE Standard, but also the stricter requirements of correct rounding for all arguments.

DECIMAL_STRING_LENGTH  
  The length of a decimal_string.

decimal_string  
  The digit buffer in a decimal_record.

decimal_record  
  The canonical form for representing an unpacked decimal floating-point number.

decimal_form  
  The type used to specify fixed or floating binary to decimal conversion.

decimal_mode  
  A struct that contains specifications for conversion between binary and decimal.

decimal_string_form  
  An enumeration of possible valid character strings representing floating-point numbers, infinities, or NaNs.
FILES
/usr/include/sys/ieeefp.h
/usr/include/fp.h
/usr/ucb/libucb.a

SEE ALSO
decimal_to_floating(3), econvert(3), floating_to_decimal(3),
ieee_handler(3M), sigfpe(3).
fopen(3S)

NAME
fopen, freopen, fdopen - open a stream

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <stdio.h>
FILE *fopen(filename, type)
char *filename, *type;
FILE *freopen(filename, type, stream)
char *filename, *type;
FILE *stream;
FILE *fdopen(fildes, type)
int fildes;
char *type;

DESCRIPTION
fopen opens the file named by filename and associates a stream with it. If the
open succeeds, fopen returns a pointer to be used to identify the stream in subse­
quent operations.
filename points to a character string that contains the name of the file to be
opened.
type is a character string having one of the following values:
   r  open for reading
   w  truncate or create for writing
   a  append: open for writing at end of file, or create for writing
   r+ open for update (reading and writing)
   w+ truncate or create for update
   a+ append; open or create for update at EOF
freopen opens the file named by filename and associates the stream pointed to by
stream with it. The type argument is used just as in fopen. The original stream is
closed, regardless of whether the open ultimately succeeds. If the open succeeds,
freopen returns the original value of stream.
freopen is typically used to attach the preopened streams associated with stdin,
stdout, and stderr to other files.
fdopen associates a stream with the file descriptor fildes. File descriptors are
obtained from calls like open, dup, creat, or pipe(2), which open files but do not
return streams. Streams are necessary input for many of the Section 3S library
routines. The type of the stream must agree with the mode of the open file.
When a file is opened for update, both input and output may be done on the
resulting stream. However, output may not be directly followed by input
without an intervening fseek or rewind, and input may not be directly followed
by output without an intervening fseek, rewind, or an input operation which
encounters EOF.
SEE ALSO
open(2), pipe(2), fclose(3S), fseek(3S), fopen(3S), malloc(3C) in the Programmer's Reference Manual.

RETURN VALUE
fopen, freopen, and fdopen return a NULL pointer on failure.

NOTES
fopen differs from the library routine of the same name in the base system only in interface.

In order to support the same number of open files that the system does, fopen must allocate additional memory for data structures using calloc [see malloc(3)] after 64 files have been opened. This confuses some programs which use their own memory allocators.
NAME
ftime - get date and time

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <sys/types.h>
#include <sys/timeb.h>
ftime(tp)
struct timeb *tp;

DESCRIPTION
The ftime entry fills in a structure pointed to by its argument, as defined by
<sys/timeb.h>:

struct timeb
{
    time_t time;
    unsigned short millitm;
    short timezone;
    short dstflag;
};

The structure contains the time since the epoch in seconds, up to 1000 mil­
seconds of more-precise interval, the local time zone (measured in minutes of
time westward from Greenwich), and a flag that, if nonzero, indicates that Day­
light Saving time applies locally during the appropriate part of the year.

SEE ALSO
NAME
getdtablesizel - get descriptor table size

SYNOPSIS
cc [ flag... ] file ... -lucb
long getdtablesize()

DESCRIPTION
Each process has a descriptor table which is guaranteed to have at least 20 slots. The entries in the descriptor table are numbered with small integers starting at 0. The call getdtablesize returns the current maximum size of this table by calling the getrlimit system call.

SEE ALSO
close(2), dup(2), getrlimit(2), and open(2) in the Programmer’s Reference Manual.
NAME
gethostid - get unique identifier of current host

SYNOPSIS
cc [ flag... ] file ... -lucb
gethostid()

DESCRIPTION
gethostid returns the 32-bit identifier for the current host, which should be
unique across all hosts. This number is usually taken from the CPU board’s ID
PROM.

This routine resides in libucb.

SEE ALSO
hostid(1)
NAME
gethostname, sethostname — get/set name of current host

SYNOPSIS
cc [ flag... ] file ... -lucb

int gethostname(name, namelen)
char *name;
int namelen;

int sethostname(name, namelen)
char *name;
int namelen;

DESCRIPTION
gethostname returns the standard host name for the current processor, as previously set by sethostname. The parameter namelen specifies the size of the array pointed to by name. The returned name is null-terminated unless insufficient space is provided.

sethostname sets the name of the host machine to be name, which has length namelen. This call is restricted to the privileged user and is normally used only when the system is bootstrapped.

RETURN VALUE
If the call succeeds a value of 0 is returned. If the call fails, then a value of -1 is returned and an error code is placed in the global location errno.

ERRORS
The following error may be returned by these calls:

EFAULT     The name or namelen parameter gave an invalid address.
EPERM       The caller was not the privileged user. Note: this error only applies to sethostname.

SEE ALSO
gethostid(3)

NOTES
Host names are limited to MAXHOSTNAMELEN characters, currently 256. (See the param.h header file.)
NAME
getpagesize - get system page size

SYNOPSIS
    cc [ flag ... ] file ... -lucb
    int getpagesize(VOID);

DESCRIPTION
    getpagesize returns the number of bytes in a page. Page granularity is the
    granularity of many of the memory management calls.
    The page size is a system page size and need not be the same as the underlying
    hardware page size.

SEE ALSO
    pagesize(1)
NAME

getpriority, setpriority - get/set program scheduling priority

SYNOPSIS

cc [ flag... ] file ... -lucb

#include <sys/time.h>
#include <sys/resource.h>

int getpriority(which, who)
int which, who;

int setpriority(which, who, prio)
int which, who, prio;

DESCRIPTION

The scheduling priority of the process, process group, or user, as indicated by
which and who is obtained with getpriority and set with setpriority. The
default priority is 0; lower priorities cause more favorable scheduling.

which is one of PRIO_PROCESS, PRIO_PGRP, or PRIO_USER, and who is interpreted relative to which (a process identifier for PRIO_PROCESS, process group identifier for
PRIO_PGRP, and a user ID for PRIO_USER). A zero value of who denotes the current
process, process group, or user.

getpriority returns the highest priority (lowest numerical value) enjoyed by
any of the specified processes. setpriority sets the priorities of all of the
specified processes to the value specified by prio. If prio is less than -20, a value
of -20 is used; if it is greater than 20, a value of 20 is used. Only the privileged
user may lower priorities.

RETURN VALUE

Since getpriority can legitimately return the value -1, it is necessary to clear
the external variable errno prior to the call, then check it afterward to determine
if a -1 is an error or a legitimate value. The setpriority call returns 0 if there
is no error, or -1 if there is.

ERRORS

getpriority and setpriority may return one of the following errors:

ESRCH  No process was located using the which and who values specified.
EINV  which was not one of PRIO_PROCESS, PRIO_PGRP, or PRIO_USER.

In addition to the errors indicated above, setpriority may fail with one of the
following errors returned:

EPERM  A process was located, but one of the following is true:

• Neither its effective nor real user ID matched the effective user ID
  of the caller, and neither the effective nor the real user ID of the
  process executing the setpriority was the privileged user.

• The call to getpriority would have changed a process' priority to
  a value lower than its current value, and the effective user ID of the
  process executing the call was not that of the privileged user.
SEE ALSO

renice(1M).


NOTES

It is not possible for the process executing setpriority to lower any other process down to its current priority, without requiring privileged user privileges.
**NAME**

getrusage - get information about resource utilization

**SYNOPSIS**

```c
cc [ flag... ] file ... -lucb
```

```c
#include <sys/time.h>
#include <sys/resource.h>

getrusage(who, rusage)
int who;
struct rusage *rusage;
```

**DESCRIPTION**

getrusage returns information about the resources utilized by the current process, or all its terminated child processes. The interpretation for some values reported, such as ru_idrss, are dependent on the clock tick interval. This interval is an implementation dependent value.

The `who` parameter is one of `RUSAGE_SELF` or `RUSAGE_CHILDREN`. The buffer to which `rusage` points will be filled in with the following structure:

```c
struct rusage {
    struct timeval ru_utime; /* user time used */
    struct timeval ru_stime; /* system time used */
    int ru_maxrss; /* maximum resident set size */
    int ru_ixrss; /* currently 0 */
    int ru_idrss; /* integral resident set size */
    int ru_isrss; /* currently 0 */
    int ru_minflt; /* page faults not requiring physical I/O */
    int ru_majflt; /* page faults requiring physical I/O */
    int ru_nswap; /* swaps */
    int ru_inblock; /* block input operations */
    int ru_ioblock; /* block output operations */
    int ru_mmsg; /* messages sent */
    int ru_mngrcv; /* messages received */
    int ru_nsignals; /* signals received */
    int ru_nvcsw; /* voluntary context switches */
    int ru_nivcsw; /* involuntary context switches */
};
```

The fields are interpreted as follows:

- **ru_utime** - The total amount of time spent executing in user mode. Time is given in seconds and microseconds.
- **ru_stime** - The total amount of time spent executing in system mode. Time is given in seconds and microseconds.
- **ru_maxrss** - The maximum resident set size. Size is given in pages (the size of a page, in bytes, is given by the `getpagesize(3)` system call). Also, see NOTES.
ru_ixrss  Currently returns 0.
ru_idrss  An integral value indicating the amount of memory in use by a
          process while the process is running. This value is the sum of
          the resident set sizes of the process running when a clock tick
          occurs. The value is given in pages times clock ticks. Note: it
          does not take sharing into account. Also, see NOTES.
ru_isrss  Currently returns 0.
ru_minflt  The number of page faults serviced which did not require any
          physical I/O activity. Also, see NOTES.
ru_majflt  The number of page faults serviced which required physical I/O
          activity. This could include page ahead operations by the kernel.
          Also, see NOTES.
ru_nswap  The number of times a process was swapped out of main
          memory.
ru_inblock The number of times the file system had to perform input in
          servicing a read(2) request.
ru_oublock The number of times the file system had to perform output in
          servicing a write(2) request.
ru_msgsnd The number of messages sent over sockets.
ru_msgrcv The number of messages received from sockets.
ru_nsignals The number of signals delivered.
ru_nvcsw  The number of times a context switch resulted due to a process
          voluntarily giving up the processor before its time slice was com-
          pleted (usually to await availability of a resource).
ru_nivcsw  The number of times a context switch resulted due to a higher
          priority process becoming runnable or because the current pro-
          cess exceeded its time slice.

RETURN VALUE
If successful, the value of the appropriate structure is filled in, and 0 is returned.
If the call fails, a -1 is returned.

ERRORS
getrusage will fail if:
EINVAL   The who parameter is not a valid value.
EFAULT   The address specified by the rusage argument is not in a valid portion
          of the process's address space.

SEE ALSO
gettimeofday(3), read(2), times(2), wait(3), write(2) in the Programmer's Refer-
ence Manual.
NOTES

Only the timeval fields of struct rusage are supported in this implementation.

The numbers ru_inblock and ru_outblock account only for real I/O, and are approximate measures at best. Data supplied by the caching mechanism is charged only to the first process to read and the last process to write the data.

The way resident set size is calculated is an approximation, and could misrepresent the true resident set size.

Page faults can be generated from a variety of sources and for a variety of reasons. The customary cause for a page fault is a direct reference by the program to a page which is not in memory. Now, however, the kernel can generate page faults on behalf of the user, for example, servicing read(2) and write(2) system calls. Also, a page fault can be caused by an absent hardware translation to a page, even though the page is in physical memory.

In addition to hardware detected page faults, the kernel may cause pseudo page faults in order to perform some housekeeping. For example, the kernel may generate page faults, even if the pages exist in physical memory, in order to lock down pages involved in a raw I/O request.

By definition, major page faults require physical I/O, while minor page faults do not require physical I/O. For example, reclaiming the page from the free list would avoid I/O and generate a minor page fault. More commonly, minor page faults occur during process startup as references to pages which are already in memory. For example, if an address space faults on some hot executable or shared library, this results in a minor page fault for the address space. Also, any one doing a read(2) or write(2) to something that is in the page cache will get a minor page fault(s) as well.

There is no way to obtain information about a child process which has not yet terminated.
NAME
gettimeofday, settimeofday - get or set the date and time

SYNOPSIS
cce [ flag... ] file ... -lucb
#include <sys/time.h>

int gettimeofday(tp, tzp)
struct timeval *tp;
struct timezone *tzp; /* obsolete */

int settimeofday(tp, tzp)
struct timeval *tp;
struct timezone *tzp; /* obsolete */

DESCRIPTION
The system's notion of the current Greenwich time is obtained with the
gettimeofday call, and set with the settimeofday call. The current time is
expressed in elapsed seconds and microseconds since 00:00 GMT, January 1, 1970
(zero hour). The resolution of the system clock is hardware dependent; the time
may be updated continuously, or in "ticks."

.tp points to a timeval structure, which includes the following members:

long tv_sec; /* seconds since Jan. 1, 1970 */
long tv_usec; /* and microseconds */

If tp is a NULL pointer, the current time information is not returned or set.

tzp is an obsolete pointer formerly used to get and set timezone information. tzp
is now ignored. Timezone information is now handled using the TZ environment
variable; see timezone(4).

Only the privileged user may set the time of day.

RETURN VALUE
A -1 return value indicates an error occurred; in this case an error code is stored
in the global variable errno.

ERRORS
The following error codes may be set in errno:
EINVAL tp specifies an invalid time.
EPERM A user other than the privileged user attempted to set the time.

SEE ALSO
adjtime(2), ctime(3C), gettimeofday(3C), timezone(4) in the Programmer's

NOTES
Time is never correct enough to believe the microsecond values.
tzp is ignored.
NAME
getusershell, setusershell, endusershell – get legal user shells

SYNOPSIS
c c [ flag... ] file ... -lucb
char *getusershell()
setusershell()
endusershell()

DESCRIPTION
getusershell returns a pointer to a legal user shell as defined by the system manager in the file /etc/shells. If /etc/shells does not exist, the locations of the standard system shells, /usr/bin/csh, /usr/bin/sh, and /usr/bin/ksh are returned.

getusershell reads the next line (opening the file if necessary); setusershell rewinds the file; endusershell closes it.

FILES
/etc/shells
/usr/bin/csh
/usr/bin/ksh
/usr/bin/sh

RETURN VALUE
The routine getusershell returns a NULL pointer (0) on EOF or error.

NOTES
All information is contained in a static area so it must be copied if it is to be saved.
getwd(3)

NAME
getwd - get current working directory pathname

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <sys/param.h>
char *getwd(pathname)
char pathname[MAXPATHLEN];

DESCRIPTION
getwd copies the absolute pathname of the current working directory to pathname
and returns a pointer to the result.

RETURN VALUE
getwd returns zero and places a message in pathname if an error occurs.

SEE ALSO
getcwd(3C) in the Programmer's Reference Manual.
NAME

ieee functions, fp_class, isnan, copysign, scalbn – miscellaneous functions for IEEE arithmetic

SYNOPSIS

cc [ flag...] file ... -lucb
#include <fp.h>
#include <math.h>
#include <stdio.h>

typedef fp_class_type fp_class (x)
double x;

typedef isnan (x)
double x;

typedef copysign (x, y)
double x, y;

typedef scalbn (x, n)
double x; int n;

DESCRIPTION

Most of these functions provide capabilities required by ANSI/IEEE Std 754-1985 or suggested in its appendix.

fp_class (x) corresponds to the IEEE’s class() and classifies x as zero, subnormal, normal, \infty, or quiet or signaling \textit{NaN}; /usr/ucbinclude/sys/ieeefp.h defines typedef fp_class_type. The following function returns 0 if the indicated condition is not satisfied:

isnan (x) returns 1 if x is NaN
copysign (x, y) returns x with y’s sign bit.
scalbn (x, n) returns x \times 2^n computed by exponent manipulation rather than by actually performing an exponentiation or a multiplication. Thus

1 \leq scalbn (fabs (x), -\log_2 (x)) < 2

for every x except 0, \infty, and NaN.

FILES

/usr/ucbinclude/sys/ieeefp.h
/usr/ucbinclude/math.h
/usr/include/values.h
**NAME**

`ieee_handler` - IEEE exception trap handler function

**SYNOPSIS**

```c
c
#include <fp.h>
int ieee_handler(action, exception, hdl)
char action[], exception[];
sigfpe_handler_type hdl;
```

**DESCRIPTION**

This function provides easy exception handling to exploit ANSI/IEEE Std 754-1985 arithmetic in a C program. All arguments are pointers to strings. Results arising from invalid arguments and invalid combinations are undefined for efficiency.

There are three types of `action`: "get", "set", and "clear". There are five types of `exception`:

- "inexact"
- "division" ... division by zero exception
- "underflow"
- "overflow"
- "invalid"
- "all" ... all five exceptions above
- "common" ... invalid, overflow, and division exceptions

Note: "all" and "common" only make sense with "set" or "clear".

`hdl` contains the address of a signal-handling routine. `<fp.h>` defines `sigfpe_handler_type`.

"get" will get the location of the current handler routine for `exception` in `hdl`.
"set" will set the routine pointed at by `hdl` to be the handler routine and at the same time enable the trap on `exception`, except when `hdl` == SIGFPE_DEFAULT or SIGFPE_IGNORE; then `ieee_handler` will disable the trap on `exception`. When `hdl` == SIGFPE_ABORT, any trap on `exception` will dump core using `abort(3)`.

"clear" "all" disables trapping on all five exceptions.

Two steps are required to intercept an IEEE-related SIGFPE code with `ieee_handler`:

1) Set up a handler with `ieee_handler`.
2) Perform a floating-point operation that generates the intended IEEE exception.

Unlike `sigfpe(3)`, `ieee_handler` also adjusts floating-point hardware mode bits affecting IEEE trapping. For "clear", "set" SIGFPE_DEFAULT, or "set" SIGFPE_IGNORE, the hardware trap is disabled. For any other "set", the hardware trap is enabled.

SIGFPE signals can be handled using `sigvec(2)`, `signal(3)`, `signal(3F)`, `sigfpe(3)`, or `ieee_handler(3M)`. In a particular program, to avoid confusion, use only one of these interfaces to handle SIGFPE signals.
EEE Handler(3M)

RETURN VALUE

**IEEE Handler** normally returns 0. In the case of "set", 1 will be returned if the action is not available (for instance, not supported in hardware).

EXAMPLE

A user-specified signal handler might look like this:

```c
void sample_handler( sig, code, scp, addr)
{
    int sig; /* sig == SIGFPE always */
    int code;
    struct sigcontext *scp;
    char *addr;

    /*
     * Sample user-written sigfpe code handler.
     * Prints a message and continues.
     * struct sigcontext is defined in <signal.h>.
     */
    printf("ieee exception code %x occurred at pc %X \n", code,scp->sc_pc);
}
```

and it might be set up like this:

```c
extern void sample_handler;
main
{
    sigfpe_handler_type hdl, old_handler1, old_handler2;
    /*
    * save current overflow and invalid handlers
    */
    ieee_handler("get","overflow",old_handler1);
    ieee_handler("get","invalid", old_handler2);
    /*
    * set new overflow handler to sample_handler and set new
    * invalid handler to SIGFPE_ABORT (abort on invalid)
    */
    hdl = (sigfpe_handler_type) sample_handler;
    if(ieee_handler("set","overflow",hdl) != 0)
        printf("ieee_handler can't set overflow \n");
    if(ieee_handler("set","invalid",SIGFPE_ABORT) != 0)
        printf("ieee_handler can't set invalid \n");
    
    /*
    * restore old overflow and invalid handlers
    */
    ieee_handler("set","overflow", old_handler1);
    ieee_handler("set","invalid", old_handler2);
}
```
FILES
/usr/include/fp.h
/usr/include/signal.h

SEE ALSO
floatingpoint(3), ieee_handler(3), sigfpe(3), signal(3) sigvec(3),
NAME
index, rindex - string operations

SYNOPSIS
#include <string.h>
char *index(s, c)
char *s, c;
char *rindex(s, c)
char *s, c;

DESCRIPTION
These functions operate on NULL-terminated strings. They do not check for
overflow of any receiving string.

index and rindex returns a pointer to the first (last) occurrence of character c in
string s, or a NULL pointer if c does not occur in the string. The NULL character
terminating a string is considered to be part of the string.

SEE ALSO
bstring(3), strings(3)
malloc(3C) in the Programmer's Reference Manual.

NOTES
For user convenience, these functions are declared in the optional <strings.h>
header file.

On the Sun processor, as well as on many other machines, you can not use a NULL
pointer to indicate a NULL string. A NULL pointer is an error and results in an
abort of the program. If you wish to indicate a NULL string, you must have a
pointer that points to an explicit NULL string. On some implementations of the C
language on some machines, a NULL pointer, if dereferenced, would yield a NULL
string; this highly non-portable trick was used in some programs. Programmers
using a NULL pointer to represent an empty string should be aware of this porta­
bility issue; even on machines where dereferencing a NULL pointer does not cause
an abort of the program, it does not necessarily yield a NULL string.

Character movement is performed differently in different implementations. Thus
overlapping moves may yield surprises.
NAME
   killpg - send signal to a process group

SYNOPSIS
   cc [ flag... ] file ... -lucb
   int killpg(pgrp, sig)
   int pgrp, sig;

DESCRIPTION
   killpg sends the signal sig to the process group pgrp. See sigvec(3) for a list of
   signals.

   The real or effective user ID of the sending process must match the real or saved
   set-user ID of the receiving process, unless the effective user ID of the sending
   process is the privileged user. A single exception is the signal SIGCONT, which
   may always be sent to any descendant of the current process.

RETURN VALUE
   Upon successful completion, a value of 0 is returned. Otherwise, a value of -1 is
   returned and the global variable errno is set to indicate the error.

ERRORS
   killpg will fail and no signal will be sent if any of the following occur:
   EINVAL       sig is not a valid signal number.
   ESRCH        No processes were found in the specified process group.
   EPERM        The effective user ID of the sending process is not privileged
                 user, and neither its real nor effective user ID matches the real or
                 saved set-user ID of one or more of the target processes.

SEE ALSO
   sigvec(3)
NAME
mctl - memory management control

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <sys/types.h>
#include <sys/mman.h>
mctl(caddr_t addr, size_t len, int function, void *arg);

DESCRIPTION
mctl applies a variety of control functions over pages identified by the mappings established for the address range \([addr, addr + len)\). The function to be performed is identified by the argument function. Valid functions are defined in mman.h as follows.

MC_LOCK
Lock the pages in the range in memory. This function is used to support mlock. See mlock(3) for semantics and usage. arg is ignored.

MC_LOCKAS
Lock the pages in the address space in memory. This function is used to support mlockall. See mlockall(3) for semantics and usage. addr and len are ignored. arg is an integer built from the flags:

- MCL_CURRENT Lock current mappings
- MCL_FUTURE Lock future mappings

MC_SYNC
Synchronize the pages in the range with their backing storage. Optionally invalidate cache copies. This function is used to support msync. See msync(3) for semantics and usage. arg is used to represent the flags argument to msync. It is constructed from an OR of the following values:

- MS_SYNC Synchronized write
- MS_ASYNC Return immediately
- MS_INVALIDATE Invalidate mappings

MS_ASYNC returns after all I/O operations are scheduled. MS_SYNC does not return until all I/O operations are complete. Specify exactly one of MS_ASYNC or MS_SYNC. MS_INVALIDATE invalidates all cached copies of data from memory, requiring them to be re-obtained from the object’s permanent storage location upon the next reference.

MC_UNLOCK
Unlock the pages in the range. This function is used to support munlock. See munlock(3) for semantics and usage. arg is ignored.

MC_UNLOCKAS
Remove address space memory lock, and locks on all current mappings. This function is used to support munlockall(3). addr and len must have the value 0. arg is ignored.
RETURN VALUE
mct1 returns 0 on success, -1 on failure.

ERRORS
mct1 fails if:

EAGAIN  Some or all of the memory identified by the operation could not be locked due to insufficient system resources.

EBUSY   MS_INVALIDATE was specified and one or more of the pages is locked in memory.

EINVAL  addr is not a multiple of the page size as returned by getpagesize.

EINVAL  addr and/or len do not have the value 0 when MC_LOCKAS or MC_UNLOCKAS are specified.

EINVAL  arg is not valid for the function specified.

EIO    An I/O error occurred while reading from or writing to the file system.

ENOMEM  Addresses in the range [addr, addr + len) are invalid for the address space of a process, or specify one or more pages which are not mapped.

EPERM  The process's effective user ID is not super-user and one of MC_LOCK, MC_LOCKAS, MC_UNLOCK, or MC_UNLOCKAS was specified.

SEE ALSO
**NAME**

`mkstemp` - make a unique file name

**SYNOPSIS**

```c
cc [ flag... ] file ... -lucb
mkstemp(template)
char *template;
```

**DESCRIPTION**

`mkstemp` creates a unique file name, typically in a temporary filesystem, by replacing `template` with a unique file name, and returns a file descriptor for the template file open for reading and writing. The string in `template` should contain a file name with six trailing xs; `mkstemp` replaces the xs with a letter and the current process ID. The letter will be chosen so that the resulting name does not duplicate an existing file. `mkstemp` avoids the race between testing whether the file exists and opening it for use.

**SEE ALSO**

`getpid(2), open(2), tmpfile(3S), tmpnam(3S)` in the *Programmer's Reference Manual*.

**RETURN VALUE**

`mkstemp` returns -1 if no suitable file could be created.

**NOTES**

It is possible to run out of letters.

`mkstemp` actually changes the template string which you pass; this means that you cannot use the same template string more than once — you need a fresh template for every unique file you want to open.

When `mkstemp` is creating a new unique filename it checks for the prior existence of a file with that name. This means that if you are creating more than one unique filename, it is bad practice to use the same root template for multiple invocations of `mkstemp`. 
NAME

mp: madd, msub, mult, mdiv, mcmp, min, mout, pow, gcd, rpow, msqrt, sdiv, itom, xtom, mtox, mfree – multiple precision integer arithmetic

SYNOPSIS

cc [ flag... ] file ... -lmmp

#include <mp.h>

madd(a, b, c)
MINT *a, *b, *c;

msub(a, b, c)
MINT *a, *b, *c;

mult(a, b, c)
MINT *a, *b, *c;

mdiv(a, b, q, r)
MINT *a, *b, *q, *r;

mcmp(a,b)
MINT *a, *b;

min(a)
MINT *a;

mout(a)
MINT *a;

pow(a, b, c, d)
MINT *a, *b, *c, *d;

gcd(a, b, c)
MINT *a, *b, *c;

rpow(a, n, b)
MINT *a, *b;
short n;

msqrt(a, b, r)
MINT *a, *b, *r;

sdiv(a, n, q, r)
MINT *a, *q;
short n, *r;

MINT *itom(n)
short n;

MINT *xtom(s)
char *s;

tchar *mtox(a)
MINT *a;

void mfree(a)
MINT *a;
DESCRIPTION
These routines perform arithmetic on integers of arbitrary length. The integers are stored using the defined type MINT. Pointers to a MINT should be initialized using the function itom, which sets the initial value to n. Alternatively, xtom may be used to initialize a MINT from a string of hexadecimal digits. mfree may be used to release the storage allocated by the itom and xtom routines.

madd, msub and mult assign to their third arguments the sum, difference, and product, respectively, of their first two arguments. mdiv assigns the quotient and remainder, respectively, to its third and fourth arguments. sdiv is like mdiv except that the divisor is an ordinary integer. msqrt produces the square root and remainder of its first argument. mcmp compares the values of its arguments and returns 0 if the two values are equal, >0 if the first argument is greater than the second, and <0 if the second argument is greater than the first. rpow calculates a raised to the power b, while pow calculates this reduced modulo m. min and mout do decimal input and output. gcd finds the greatest common divisor of the first two arguments, returning it in the third argument. mtox provides the inverse of xtom. To release the storage allocated by mtox, use free [see malloc(3)].

Use the -libmp loader option to obtain access to these functions.

RETURN VALUE
Illegal operations and running out of memory produce messages and core images.

FILES
/usr/ucblib/libmp.a

SEE ALSO
NAME

ndbm: dbm_clearerr, dbm_close, dbm_delete, dbm_error, dbm_fetch, dbm_firstkey, dbm_nextkey, dbm_open, dbm_store - data base subroutines

SYNOPSIS

c C [flag...] file ... -ldbm

#include <ndbm.h>

typedef struct {
    char *dptr;
    int dsize;
} datum;

int dbm_clearerr(db)
    DBM *db;

void dbm_close (db)
    DBM *db;

int dbm_delete(db, key)
    DBM *db;
    datum key;

int dbm_error(db)
    DBM *db;

datum dbm_fetch(db, key)
    DBM *db;
    datum key;

datum dbm_firstkey(db)
    DBM *db;

datum dbm_nextkey(db)
    DBM *db;

DBM *dbm_open(file, flags, mode)
    char *file;
    int flags, mode;

int dbm_store(db, key, content, flags)
    DBM *db;
    datum key, content;
    int flags;

DESCRIPTION

These functions maintain key/content pairs in a data base. The functions will handle very large (a billion blocks) data base and will access a keyed item in one or two file system accesses. This package replaces the earlier dbm(3X) library, which managed only a single data base.

keys and contents are described by the datum typedef. A datum specifies a string of dsize bytes pointed to by dptr. Arbitrary binary data, as well as normal ASCII strings, are allowed. The data base is stored in two files. One file is a directory containing a bit map and has .dir as its suffix. The second file contains all data and has .pag as its suffix.
Before a data base can be accessed, it must be opened by `dbm_open`. This will open and/or create the files `file.dir` and `file.pag` depending on the flags parameter (see `open(2)`).

A data base is closed by calling `dbm_close`.

Once open, the data stored under a key is accessed by `dbm_fetch` and data is placed under a key by `dbm_store`. The `flags` field can be either `DBM_INSERT` or `DBM_REPLACE`. `DBM_INSERT` will only insert new entries into the data base and will not change an existing entry with the same key. `DBM_REPLACE` will replace an existing entry if it has the same key. A key (and its associated contents) is deleted by `dbm_delete`. A linear pass through all keys in a data base may be made, in an (apparently) random order, by use of `dbm_firstkey` and `dbm_nextkey`. `dbm_firstkey` will return the first key in the data base. `dbm_nextkey` will return the next key in the data base. This code will traverse the data base:

```c
for (key = dbm_firstkey(db); key.dptr != NULL; key = dbm_nextkey(db))
    ...
```

`dbm_error` returns non-zero when an error has occurred reading or writing the data base. `dbm_clearerr` resets the error condition on the named data base.

**SEE ALSO**

`open(2)`, `dbm(3X)` in the *Programmer’s Reference Manual*.

**RETURN VALUE**

All functions that return an int indicate errors with negative values. A zero return indicates no error. Routines that return a `datum` indicate errors with a `NULL` (`0`) `dptr`. If `dbm_store` is called with a `flags` value of `DBM_INSERT` and finds an existing entry with the same key, it returns 1.

**NOTES**

The `.pag` file will contain holes so that its apparent size is about four times its actual content. Older versions of the UNIX operating system may create real file blocks for these holes when touched. These files cannot be copied by normal means (`cp(1)`, `cat(1)`, `tar(1)`, `ar(1)`) without filling in the holes.

`dptr` pointers returned by these subroutines point into static storage that is changed by subsequent calls.

The sum of the sizes of a `key/content` pair must not exceed the internal block size (currently 4096 bytes). Moreover all `key/content` pairs that hash together must fit on a single block. `dbm_store` will return an error in the event that a disk block fills with inseparable data.

`dbm_delete` does not physically reclaim file space, although it does make it available for reuse.

The order of keys presented by `dbm_firstkey` and `dbm_nextkey` depends on a hashing function.

There are no interlocks and no reliable cache flushing; thus concurrent updating and reading is risky.
NAME
nice – change priority of a process

SYNOPSIS
cc [ flag... ] file ... -lucb
int nice(increment)
int increment;

DESCRIPTION
The scheduling priority of the process is augmented by *increment*. Positive priorities get less service than normal. Priority 10 is recommended to users who wish to execute long-running programs without undue impact on system performance.

Negative increments are illegal, except when specified by the privileged user. The priority is limited to the range -20 (most urgent) to 20 (least). Requests for values above or below these limits result in the scheduling priority being set to the corresponding limit.

The priority of a process is passed to a child process by *fork*(2). For a privileged process to return to normal priority from an unknown state, *nice* should be called successively with arguments -40 (goes to priority -20 because of truncation), 20 (to get to 0), then 0 (to maintain compatibility with previous versions of this call).

RETURN VALUE
Upon successful completion, *nice* returns 0. Otherwise, a value of -1 is returned and *errno* is set to indicate the error.

ERRORS
The priority is not changed if:

EINVAL

The value of *increment* specified was negative, and the effective user ID is not the privileged user.

SEE ALSO
renice(1M)
nice(1), priori(2) in the *User’s Reference Manual.*
fork(2), getpriority(2), priori(2) in the *Programmer’s Reference Manual.*
NAME
nlist - get entries from symbol table

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <nlist.h>
int nlist(filename, nl)
    char *filename;
    struct nlist *nl;

DESCRIPTION
nlist examines the symbol table from the executable image whose name is
pointed to by filename, and selectively extracts a list of values and puts them in
the array of nlist structures pointed to by nl. The name list pointed to by nl
consists of an array of structures containing names, types and values. The
n_name field of each such structure is taken to be a pointer to a character string
representing a symbol name. The list is terminated by an entry with a NULL
pointer (or a pointer to a NULL string) in the n_name field. For each entry in nl, if
the named symbol is present in the executable image's symbol table, its value and
type are placed in the n_value and n_type fields. If a symbol cannot be located,
the corresponding n_type field of nl is set to zero.

RETURN VALUE
Upon normal completion, nlist returns the number of symbols that were not
located in the symbol table. If an error occurs, nlist returns -1 and sets all of
the n_type fields in members of the array pointed to by nl to zero.

SEE ALSO
NAME

printf, fprintf, sprintf, vprintf, vfprintf, vsprintf - formatted output conversion

SYNOPSIS

cc [flag... ] file ... -lucb
#include <stdio.h>
int printf(format [, arg ] ... )
char *format;
int fprintf(stream, format [, arg ] ... )
FILE *stream;
char *format;
char *sprintf(s, format [, arg ] ... )
char *s, *format;
int vprintf(format, ap)
char *format;
va_list ap;
int vfprintf(stream, format, ap)
FILE *stream;
char *format;
va_list ap;
char *vsprintf(s, format, ap)
char *s, *format;
va_list ap;

DESCRIPTION

printf places output on the standard output stream stdout. fprintf places output on the named output stream. sprintf places "output," followed by the NULL character (\0), in consecutive bytes starting at *s; it is the user's responsibility to ensure that enough storage is available.

vprintf, vfprintf, and vsprintf are the same as printf, fprintf, and sprintf respectively, except that instead of being called with a variable number of arguments, they are called with an argument list as defined by varargs(5).

Each of these functions converts, formats, and prints its args under control of the format. The format is a character string which contains two types of objects: plain characters, which are simply copied to the output stream, and conversion specifications, each of which causes conversion and printing of zero or more args. The results are undefined if there are insufficient args for the format. If the format is exhausted while args remain, the excess args are simply ignored.

Each conversion specification is introduced by the character %. After the %, the following appear in sequence:

Zero or more flags, which modify the meaning of the conversion specification.
An optional decimal digit string specifying a minimum field width. If the converted value has fewer characters than the field width, it will be padded on the left (or right, if the left-adjustment flag '-', described below, has been given) to the field width. The padding is with blanks unless the field width digit string starts with a zero, in which case the padding is with zeros.

A precision that gives the minimum number of digits to appear for the d, i, o, u, x, or X conversions, the number of digits to appear after the decimal point for the e, E, and f conversions, the maximum number of significant digits for the g and G conversion, or the maximum number of characters to be printed from a string in s conversion. The precision takes the form of a period (.) followed by a decimal digit string; a NULL digit string is treated as zero. Padding specified by the precision overrides the padding specified by the field width.

An optional 1 (ell) specifying that a following d, i, o, u, x, or X conversion character applies to a long integer arg. An 1 before any other conversion character is ignored.

A character that indicates the type of conversion to be applied.

A field width or precision or both may be indicated by an asterisk (*) instead of a digit string. In this case, an integer arg supplies the field width or precision. The arg that is actually converted is not fetched until the conversion letter is seen, so the args specifying field width or precision must appear before the arg (if any) to be converted. A negative field width argument is taken as a '-' flag followed by a positive field width. If the precision argument is negative, it will be changed to zero.

The flag characters and their meanings are:
- The result of the conversion will be left-justified within the field.
+ The result of a signed conversion will always begin with a sign (+ or -).
blank If the first character of a signed conversion is not a sign, a blank will be prefixed to the result. This implies that if the blank and + flags both appear, the blank flag will be ignored.
# This flag specifies that the value is to be converted to an "alternate form." For c, d, i, s, and u conversions, the flag has no effect. For o conversion, it increases the precision to force the first digit of the result to be a zero. For x or X conversion, a non-zero result will have 0x or 0X prefixed to it. For e, E, f, g, and G conversions, the result will always contain a decimal point, even if no digits follow the point (normally, a decimal point appears in the result of these conversions only if a digit follows it). For g and G conversions, trailing zeroes will not be removed from the result (which they normally are).

The conversion characters and their meanings are:
d, i, o, u, x, X

The integer arg is converted to signed decimal (d or i), unsigned octal (o), unsigned decimal (u), or unsigned hexadecimal notation (x and X), respectively; the letters abedef are used for x conversion and the
letters ABCDEF for X conversion. The precision specifies the minimum number of digits to appear; if the value being converted can be represented in fewer digits, it will be expanded with leading zeroes. (For compatibility with older versions, padding with leading zeroes may alternatively be specified by prepending a zero to the field width. This does not imply an octal value for the field width.) The default precision is 1. The result of converting a zero value with a precision of zero is a NULL string.

**f**

The float or double `arg` is converted to decimal notation in the style `[-]d.dd ddd` where the number of digits after the decimal point is equal to the precision specification. If the precision is missing, 6 digits are given; if the precision is explicitly 0, no digits and no decimal point are printed.

**e,E**

The float or double `arg` is converted in the style `[-]d.d ddd e±ddd`, where there is one digit before the decimal point and the number of digits after it is equal to the precision; when the precision is missing, 6 digits are produced; if the precision is zero, no decimal point appears. The E format code will produce a number with E instead of e introducing the exponent. The exponent always contains at least two digits.

**g,G**

The float or double `arg` is printed in style f or e (or in style E in the case of a G format code), with the precision specifying the number of significant digits. The style used depends on the value converted: style e or E will be used only if the exponent resulting from the conversion is less than -4 or greater than the precision. Trailing zeroes are removed from the result; a decimal point appears only if it is followed by a digit.

The e, E, f, g, and G formats print IEEE indeterminate values (infinity or not-a-number) as “Infinity” or “NaN” respectively.

**c**

The character `arg` is printed.

**s**

The `arg` is taken to be a string (character pointer) and characters from the string are printed until a NULL character (`\0`) is encountered or until the number of characters indicated by the precision specification is reached. If the precision is missing, it is taken to be infinite, so all characters up to the first NULL character are printed. A NULL value for `arg` will yield undefined results.

**%**

Print a %; no argument is converted.

In no case does a non-existent or small field width cause truncation of a field; if the result of a conversion is wider than the field width, the field is simply expanded to contain the conversion result. Padding takes place only if the specified field width exceeds the actual width. Characters generated by printf and fprintf are printed as if putc(3S) had been called.

**RETURN VALUE**

Upon success, printf and fprintf return the number of characters transmitted, excluding the null character. vprintf and vfprintf return the number of characters transmitted. sprintf and vsprintf always return s. If an output error is encountered, printf, fprintf, vprintf, and vfprintf, return EOF.
EXAMPLE
To print a date and time in the form “Sunday, July 3, 10:02,” where \textit{weekday} and \textit{month} are pointers to NULL-terminated strings:
\begin{verbatim}
    printf("%s, %s %d, %d:%.2d", weekday, month, day, hour, min);
\end{verbatim}
To print \( \pi \) to 5 decimal places:
\begin{verbatim}
    printf("pi = %.5f", 4 * \texttt{atan}(1.0));
\end{verbatim}

SEE ALSO
    econvert(3)
    putc(3S), scanf(3S), varargs(5), vprintf(3S) in the \textit{Programmer's Reference Manual}.

NOTES
Very wide fields (>128 characters) fail.
NAME
   psignal, sys_siglist — system signal messages

SYNOPSIS
   cc [ flag... ] file ... -lucb
   psignal(sig, s)
   unsigned sig;
   char *s;
   char *sys_siglist[];

DESCRIPTION
   psignal produces a short message on the standard error file describing the indicated signal. First the argument string s is printed, then a colon, then the name of the signal and a NEWLINE. Most usefully, the argument string is the name of the program which incurred the signal. The signal number should be from among those found in <signal.h>.

   To simplify variant formatting of signal names, the vector of message strings sys_siglist is provided; the signal number can be used as an index in this table to get the signal name without the newline. The define NSIG defined in <signal.h> is the number of messages provided for in the table; it should be checked because new signals may be added to the system before they are added to the table.

SEE ALSO
   signal(3)
   perror(3C) in the Programmer's Reference Manual.
NAME
rand, srand - simple random number generator

SYNOPSIS
cc [ flag... ] file ... -lucb
srand(seed)
int seed;
rnd()

DESCRIPTION
rand uses a multiplicative congruential random number generator with period $2^{32}$
to return successive pseudo-random numbers in the range from 0 to $2^{31}-1$.
srand can be called at any time to reset the random-number generator to a ran­
dom starting point. The generator is initially seeded with a value of 1.

SEE ALSO
random(3).
drand48(2), drand(3C), rand(3C), srand(3C) in the Programmer’s Reference Manual.

NOTES
The spectral properties of rand leave a great deal to be desired. drand48(2) and
random(3) provide much better, though more elaborate, random-number genera­
tors.
The low bits of the numbers generated are not very random; use the middle bits.
In particular the lowest bit alternates between 0 and 1.
random(3)

NAME
random, srandom, initstate, setstate – better random number generator; rou­
tines for changing generators

SYNOPSIS
cc [ flag... ] file ... -lucb
long random()
srandom(seed)
int seed;
char *initstate(seed, state, n)
unsigned seed;
char *state;
int n;
char *setstate(state)
char *state;

DESCRIPTION
random uses a non-linear additive feedback random number generator employing
a default table of size 31 long integers to return successive pseudo-random
numbers in the range from 0 to 2^{31} - 1. The period of this random number gen­
erator is very large, approximately 16x(2^{31} - 1).

random/srandom have (almost) the same calling sequence and initialization pro­
perties as rand/srand [see rand(3C)]. The difference is that rand(3C) produces a
much less random sequence—in fact, the low dozen bits generated by rand go
through a cyclic pattern. All the bits generated by random are usable. For exam­
ple,

random() & 01

will produce a random binary value.

Unlike srandom, srandom does not return the old seed because the amount of state
information used is much more than a single word. Two other routines are pro­
vided to deal with restarting/changing random number generators. Like
rand(3C), however, random will, by default, produce a sequence of numbers that
can be duplicated by calling srandom with 1 as the seed.

The initstate routine allows a state array, passed in as an argument, to be ini­
ialized for future use. n specifies the size of state in bytes. initstate uses n to
decide how sophisticated a random number generator it should use—the more
state, the better the random numbers will be. Current “optimal” values for the
amount of state information are 8, 32, 64, 128, and 256 bytes; other amounts will
be rounded down to the nearest known amount. Using less than 8 bytes will
cause an error. The seed for the initialization (which specifies a starting point for
the random number sequence, and provides for restarting at the same point) is
also an argument. initstate returns a pointer to the previous state information
array.
Once a state has been initialized, the \texttt{setstate} routine provides for rapid switching between states. \texttt{setstate} returns a pointer to the previous state array; its argument state array is used for further random number generation until the next call to \texttt{initstate} or \texttt{setstate}.

Once a state array has been initialized, it may be restarted at a different point either by calling \texttt{initstate} (with the desired seed, the state array, and its size) or by calling both \texttt{setstate} (with the state array) and \texttt{srandom} (with the desired seed). The advantage of calling both \texttt{setstate} and \texttt{srandom} is that the size of the state array does not have to be remembered after it is initialized.

With 256 bytes of state information, the period of the random number generator is greater than $2^{69}$, which should be sufficient for most purposes.

\section*{EXAMPLE}

/* Initialize an array and pass it in to \texttt{initstate}. */

\begin{verbatim}
static long state1[32] = {
3,
0x9a319039, 0x32d9c024, 0x9b663182, 0x5da1f342,
0x749e56b, 0xbeb1db0, 0xab5c5918, 0x946554fd,
0x8c2e680f, 0xeb3d799f, 0xb1ee0b7, 0x2d43eb86,
0xda672e2a, 0x1588ca88, 0xe369735d, 0x904f35f7,
0xd7158df6, 0x6fa6f051, 0x616e6b96, 0xac94efdc,
0xde3b81e0, 0xdf0a6fb5, 0xf103bc02, 0x48f340fb,
0x36413f93, 0xc622c298, 0xf5a42ab8, 0x8a88d77b,
0xf5ad9d0e, 0x8999220b, 0x27fb47b9
};

main()
{
    unsigned seed;
    int n;
    seed = 1;
    n = 128;
    initstate(seed, state1, n);
    setstate(state1);
    printf('%d0, random());
    
    
}
\end{verbatim}

\section*{SEE ALSO}

\texttt{rand(3C)}, \texttt{drand48(2)}, \texttt{drand(3C)}, \texttt{rand(3C)}, \texttt{srand(3C)} in the \textit{Programmer's Reference Manual}.

\section*{RETURN VALUE}

If \texttt{initstate} is called with less than 8 bytes of state information, or if \texttt{setstate} detects that the state information has been garbled, error messages are printed on the standard error output.

\section*{NOTES}

About two-thirds the speed of \texttt{rand(3C)}.
NAME
reboot - reboot system or halt processor

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <sys/reboot.h>
reboot(howto, [ bootargs ])
int howto;
char *bootargs;

DESCRIPTION
reboot reboots the system, and is invoked automatically in the event of unrecoverable system failures. howto is a mask of options passed to the bootstrap program. The system call interface permits only RB_HALT or RB_AUTOBOOT to be passed to the reboot program; the other flags are used in scripts stored on the console storage media, or used in manual bootstrap procedures. When none of these options (for instance RB_AUTOBOOT) is given, the system is rebooted from file /stand/unix. An automatic consistency check of the disks is then normally performed.

The bits of howto that are used are:

RB_HALT the processor is simply halted; no reboot takes place. RB_HALT should be used with caution.

RB_ASKNAME Interpreted by the bootstrap program itself, causing it to inquire as to what file should be booted. Normally, the system is booted from the file /stand/unix without asking.

RETURN VALUE
If successful, this call never returns. Otherwise, a -1 is returned and an error is returned in the global variable errno.

ERRORS
EPERM The caller is not the super-user.

FILES
/vmunix

SEE ALSO
halt(1M) init(1M) reboot(1M)

NOTES
Any other howto argument causes /stand/unix to boot.
Only the super-user may reboot a machine.

10/89
NAME
regex, re_comp, re_exec - regular expression handler

SYNOPSIS
cc [ flag... ] file ... -lucb
char *re_comp(s)
char *s;
re_exec(s)
char *s;

DESCRIPTION
re_comp compiles a string into an internal form suitable for pattern matching.
re_exec checks the argument string against the last string passed to re_comp.
re_comp returns a NULL pointer if the string s was compiled successfully; otherwise a string containing an error message is returned. If re_comp is passed 0 or a NULL string, it returns without changing the currently compiled regular expression.
re_exec returns 1 if the string s matches the last compiled regular expression, 0 if the string s failed to match the last compiled regular expression, and -1 if the compiled regular expression was invalid (indicating an internal error).
The strings passed to both re_comp and re_exec may have trailing or embedded NEWLINE characters; they are terminated by NULL characters. The regular expressions recognized are described in the manual entry for ed(l), given the above difference.

SEE ALSO

RETURN VALUE
re_exec returns -1 for an internal error.
re_comp returns one of the following strings if an error occurs:
No previous regular expression
Regular expression too long
unmatched \(
missing ]
too many \()\) pairs
unmatched \)
NAME
scandir, alphasort - scan a directory

SYNOPSIS
cc [ flag... ] file ... -1ucb
#include <sys/types.h>
#include <sys/dir.h>
scandir(dirname, &namelist, select, compar)
char *dirname;
struct direct **namelist;
int (*select)();
int (*compar)();
alphasort(d1, d2)
struct direct **d1, **d2;

DESCRIPTION
scandir reads the directory dirname and builds an array of pointers to directory entries using malloc(3C). The second parameter is a pointer to an array of structure pointers. The third parameter is a pointer to a routine which is called with a pointer to a directory entry and should return a non zero value if the directory entry should be included in the array. If this pointer is NULL, then all the directory entries will be included. The last argument is a pointer to a routine which is passed to qsort(3C) to sort the completed array. If this pointer is NULL, the array is not sorted. alphasort is a routine which will sort the array alphabetically.

scandir returns the number of entries in the array and a pointer to the array through the parameter namelist.

SEE ALSO
getdents(2), directory(3C), malloc(3C), qsort(3C) in the Programmer's Reference Manual.

RETURN VALUE
Returns -1 if the directory cannot be opened for reading or if malloc(3C) cannot allocate enough memory to hold all the data structures.
NAME

setbuf, setbuffer, setlinebuf, setvbuf - assign buffering to a stream

SYNOPSIS

cc [ flag... ] file ... -lucb

#include <stdio.h>

setbuf(stream, buf)
FILE *stream;
char *buf;

setbuffer(stream, buf, size)
FILE *stream;
char *buf;
int size;

setlinebuf(stream)
FILE *stream;

int setvbuf(stream, buf, type, size)
FILE *stream;
char *buf;
int type, size;

DESCRIPTION

The three types of buffering available are unbuffered, block buffered, and line buffered. When an output stream is unbuffered, information appears on the destination file or terminal as soon as written; when it is block buffered many characters are saved up and written as a block; when it is line buffered characters are saved up until a NEWLINE is encountered or input is read from stdin. fflush (see fclose(3S)) may be used to force the block out early. Normally all files are block buffered. A buffer is obtained from malloc(3C) upon the first getc or putc(3S) on the file. If the standard stream stdout refers to a terminal it is line buffered. The standard stream stderr is unbuffered by default.

setbuf can be used after a stream has been opened but before it is read or written. It causes the array pointed to by buf to be used instead of an automatically allocated buffer. If buf is the NULL pointer, input/output will be completely unbuffered. A manifest constant BUFSIZ, defined in the <stdio.h> header file, tells how big an array is needed:

    char buf[BUFSIZ];

setbuffer, an alternate form of setbuf, can be used after a stream has been opened but before it is read or written. It uses the character array buf whose size is determined by the size argument instead of an automatically allocated buffer. If buf is the NULL pointer, input/output will be completely unbuffered.

setvbuf can be used after a stream has been opened but before it is read or written. type determines how stream will be buffered. Legal values for type (defined in <stdio.h>) are:


NOTE

A common source of error is allocating buffer space as an "automatic" variable in a code block, and then failing to close the stream in the same block.

SEE ALSO

fclose(3S), fopen(3S), fread(3S), getc(3S), malloc(3C), printf(3S), putc(3S), puts(3S), setbuf(3S) in the Programmer's Reference Manual.

RETURN VALUE

If an illegal value for type or size is provided, setvbuf returns a non-zero value. Otherwise, the value returned will be zero.
setbuffer(3S)

NAME
   setbuffer, setlinebuf — assign buffering to a stream

SYNOPSIS
   cc [ flag... ] file ... -lucb
# include <stdio.h>
   setbuffer(stream, buf, size)
   FILE *stream;
   char *buf;
   int size;
   setlinebuf(stream)
   FILE *stream;

DESCRIPTION
   The three types of buffering available are unbuffered, block buffered, and line
   buffered. When an output stream is unbuffered, information appears on the desti­
   nation file or terminal as soon as written; when it is block buffered many char­
   acters are saved up and written as a block; when it is line buffered characters are
   saved up until a NEWLINE is encountered or input is read from any line buffered
   input stream. fflush (see fclose(3S)) may be used to force the block out early.
   Normally all files are block buffered. A buffer is obtained from malloc(3C) upon
   the first getc or putc(3S) on the file.
   By default, output to a terminal is line buffered, except for output to the standard
   stream stderr which is unbuffered, and all other input/output is fully buffered.
   setbuffer can be used after a stream has been opened but before it is read or
   written. It uses the character array buf whose size is determined by the size argu­
   ment instead of an automatically allocated buffer. If buf is the NULL pointer,
   input/output will be completely unbuffered. A manifest constant BUFSIZ,
   defined in the <stdio.h> header file, tells how big an array is needed:
      
      char buf [BUFSIZ];

   setlinebuf is used to change the buffering on a stream from block buffered or
   unbuffered to line buffered. Unlike setbuffer, it can be used at any time that
   the file descriptor is active.
   A file can be changed from unbuffered or line buffered to block buffered by using
   freopen (see fopen(3S)). A file can be changed from block buffered or line buf­
   ered to unbuffered by using freopen followed by setbuffer with a buffer argu­
   ment of NULL.

SEE ALSO
   setbuf(3S)
   fclose(3S), fopen(3S), fread(3S), getc(3S), malloc(3C), printf(3S), putc(3S),
   puts(3S), setbuf(3S) in the Programmer's Reference Manual.

NOTE
   A common source of error is allocating buffer space as an automatic variable in a
   code block, and then failing to close the stream in the same block.
NAME

setjmp, longjmp, _setjmp, _longjmp, sigsetjmp, siglongjmp - non-local goto

SYNOPSIS

cc [ flag... ] file ... -lucb
#include <setjmp.h>

int setjmp(env)
    jmp_buf env;

longjmp(env, val)
    jmp_buf env;

int val;

int _setjmp(env)
    jmp_buf env;

_longjmp(env, val)
    jmp_buf env;

int val;

int sigsetjmp(env, savemask)
    sigjmp_buf env;

int savemask;

siglongjmp(env, val)
    sigjmp_buf env;

int val;

DESCRIPTION

setjmp and longjmp are useful for dealing with errors and interrupts encoun-
tered in a low-level subroutine of a program.

setjmp saves its stack environment in env for later use by longjmp. A normal
call to setjmp returns zero. setjmp also saves the register environment. If a
longjmp call will be made, the routine which called setjmp should not return
until after the longjmp has returned control (see below).

longjmp restores the environment saved by the last call of setjmp, and then
returns in such a way that execution continues as if the call of setjmp had just
returned the value val to the function that invoked setjmp; however, if val were
zero, execution would continue as if the call of setjmp had returned one. This
ensures that a "return" from setjmp caused by a call to longjmp can be dis-
tinguished from a regular return from setjmp. The calling function must not
itself have returned in the interim, otherwise longjmp will be returning control to
a possibly non-existent environment. All memory-bound data have values as of
the time longjmp was called. The CPU and floating-point data registers are
restored to the values they had at the time that setjmp was called. But, because
the register storage class is only a hint to the C compiler, variables declared as
register variables may not necessarily be assigned to machine registers, so their
values are unpredictable after a longjmp. This is especially a problem for pro-
grammers trying to write machine-independent C routines.
setjmp(3)  

setjmp and longjmp save and restore the signal mask (see sigsetmask(2)), while _setjmp and _longjmp manipulate only the C stack and registers. If the savemask flag to sigsetjmp is non-zero, the signal mask is saved, and a subsequent siglongjmp using the same env will restore the signal mask. If the savemask flag is zero, the signal mask is not saved, and a subsequent siglongjmp using the same env will not restore the signal mask. In all other ways, _setjmp and sigsetjmp function in the same way that setjmp does, and _longjmp and siglongjmp function in the same way that longjmp does.

None of these functions save or restore any floating-point status or control registers.

EXAMPLE

The following code fragment indicates the flow of control of the set jmp and long jmp combination:

```c
function declaration
...
    jmp_buf my_environment;
...
    if (setjmp(my_environment)) {
        /* register variables have unpredictable values */
        code after the return from longjmp
        ...
    } else {
        /* do not modify register vars in this leg of code */
        this is the return from set jmp
        ...
    }
```

SEE ALSO

cc(1), signal(3), sigsetmask(3), sigvec(3).

cc(1), signal(2), setjmp(3C) in the Programmer's Reference Manual.

BUGS

setjmp does not save the current notion of whether the process is executing on the signal stack. The result is that a longjmp to some place on the signal stack leaves the signal stack state incorrect.

On some systems set jmp also saves the register environment. Therefore, all data that are bound to registers are restored to the values they had at the time that set jmp was called. All memory-bound data have values as of the time longjmp was called. However, because the register storage class is only a hint to the C compiler, variables declared as register variables may not necessarily be assigned to machine registers, so their values are unpredictable after a longjmp.

When using compiler options that specify automatic register allocation (see cc(1V)), the compiler will not attempt to assign variables to registers in routines that call set jmp.

longjmp never causes set jmp to return zero, so programmers should not depend on longjmp being able to cause set jmp to return zero.
NAME
setregid — set real and effective group IDs

SYNOPSIS
cc [ flag... ] file ... -lucb
int setregid(rgid, egid)
int rgid, egid;

DESCRIPTION
setregid is used to set the real and effective group IDs of the calling process. If
rgid is -1, the real GID is not changed; if egid is -1, the effective GID is not changed. The real and effective GIDs may be set to different values in the same
call.

If the effective user ID of the calling process is super-user, the real GID and the
effective GID can be set to any legal value.

If the effective user ID of the calling process is not super-user, either the real GID
can be set to the saved setGID from execv, or the effective GID can either be set
to the saved setGID or the real GID. Note: if a setGID process sets its effective GID
to its real GID, it can still set its effective GID back to the saved setGID.

In either case, if the real GID is being changed (that is, if rgid is not -1), or the
effective GID is being changed to a value not equal to the real GID, the saved set-
GID is set equal to the new effective GID.

If the real GID is changed from its current value, the old value is removed from
the groups access list (see getgroups(2)) if it is present in that list, and the new
value is added to the groups access list if it is not already present and if this
would not cause the number of groups in that list to exceed NGROUPS, as defined
in /usr/include/sys/param.h.

RETURN VALUE
Upon successful completion, a value of 0 is returned. Otherwise, a value of -1 is
returned and errno is set to indicate the error.

ERRORS
setregid will fail and neither of the group IDs will be changed if:

EPERM The calling process’s effective UID is not the super-user and a
change other than changing the real GID to the saved setGID, or
changing the effective GID to the real GID or the saved GID, was
specified.

SEE ALSO
setreuid(3)
NAME
setreuid - set real and effective user IDs

SYNOPSIS
cc [ flag... ] file ... -lucb
int setreuid(ruid, euid)
int ruid, euid;

DESCRIPTION
setreuid is used to set the real and effective user IDs of the calling process. If
ruid is -1, the real user ID is not changed; if euid is -1, the effective user ID is not
changed. The real and effective user IDs may be set to different values in the
same call.

If the effective user ID of the calling process is super-user, the real user ID and the
effective user ID can be set to any legal value.

If the effective user ID of the calling process is not super-user, either the real user
ID can be set to the effective user ID, or the effective user ID can either be set to
the saved set-user ID from execv or the real user ID. Note: if a set-UID process
sets its effective user ID to its real user ID, it can still set its effective user ID back
to the saved set-user ID.

In either case, if the real user ID is being changed (that is, if ruid is not -1), or the
effective user ID is being changed to a value not equal to the real user ID, the
saved set-user ID is set equal to the new effective user ID.

RETURN VALUE
Upon successful completion, a value of 0 is returned. Otherwise, a value of -1 is
returned and errno is set to indicate the error.

ERRORS
setreuid will fail and neither of the user IDs will be changed if:

EPERM The calling process’s effective user ID is not the super-user and a
change other than changing the real user ID to the effective user
ID, or changing the effective user ID to the real user ID or the
saved set-user ID, was specified.

SEE ALSO
setregid(3)
NAME

sigblock, sigmask - block signals

SYNOPSIS

cc [ flag... ] file ... -lucb
#include <signal.h>
sigblock(mask);
int mask;
define sigmask(signum)

DESCRIPTION

sigblock adds the signals specified in mask to the set of signals currently being
blocked from delivery. Signals are blocked if the appropriate bit in mask is a 1;
the macro sigmask is provided to construct the mask for a given signum. The
previous mask is returned, and may be restored using sigsetmask(3).

It is not possible to block SIGKILL, SIGSTOP, or SIGCONT; this restriction is
silently imposed by the system.

RETURN VALUE

The previous set of masked signals is returned.

SEE ALSO

sigsetmask(2), sigvec(2)
**NAME**

sigfpe — signal handling for specific SIGFPE codes

**SYNOPSIS**

```c
cc [ flag...] file ... -lucb
#include <signal.h>
#include <floatingpoint.h>
sigfpe_handler_type sigfpe(code, hdl)
sigfpe_code_type code;
sigfpe_handler_type hdl;
```

**DESCRIPTION**

This function allows signal handling to be specified for particular SIGFPE codes. A call to `sigfpe` defines a new handler `hdl` for a particular SIGFPE `code` and returns the old handler as the value of the function `sigfpe`. Normally handlers are specified as pointers to functions; the special cases SIGFPE_IGNORE, SIGFPE_ABORT, and SIGFPE_DEFAULT allow ignoring, specifying core dump using `abort(3)`, or default handling respectively.

For these IEEE-related codes:

- **FPE_FLTINEX_TRAP** — floating inexact result
- **FPE_FLTDIV_TRAP** — floating division by zero
- **FPE_FLTUND_TRAP** — floating underflow
- **FPE_FTOVF_TRAP** — floating overflow
- **FPE_FLTSUN_TRAP** — branch or set on unordered
- **FPE_FLTOPERR_TRAP** — floating operand error
- **FPE_FLTNAN_TRAP** — floating Not-A-Number

Default handling is defined to be to call the handler specified to `ieee_handler(3M)`.

For all other SIGFPE codes, default handling is to core dump using `abort(3)`.

The compilation option `#fpa` causes FPA recomputation to replace the default `abort` action for code `FPE_FPA_ERROR`. Note: `SIGFPE_DEFAULT` will restore `abort` rather than FPA recomputation for this code.

Three steps are required to intercept an IEEE-related SIGFPE code with `sigfpe`:

1. Set up a handler with `sigfpe`.
2. Enable the relevant IEEE trapping capability in the hardware, perhaps by using assembly-language instructions.
3. Perform a floating-point operation that generates the intended IEEE exception.

Unlike `ieee_handler(3M)`, `sigfpe` never changes floating-point hardware mode bits affecting IEEE trapping. No IEEE-related SIGFPE signals will be generated unless those hardware mode bits are enabled.
SIGFPE signals can be handled using `sigvec(2)`, `signal(3)`, `sigfpe(3)`, or `ieee_handler(3M)`. In a particular program, to avoid confusion, use only one of these interfaces to handle SIGFPE signals.

**EXAMPLE**

A user-specified signal handler might look like this:

```c
void sample_handler( sig, code, scp, addr )
    int sig;       /* sig == SIGFPE always */
    int code;
    struct sigcontext *scp;
    char *addr;
{
    /*
        Sample user-written sigfpe code handler.
        Prints a message and continues.
        struct sigcontext is defined in <signal.h>.
    */
    printf(" ieee exception code %x occurred at pc %X \n",
          code,scp->sc_pc);
}
```

and it might be set up like this:

```c
extern void sample_handler;
main
{
    sigfpe_handler_type hdl, old_handler1, old_handler2;
    /*
    * save current overflow and invalid handlers; set the new
    * overflow handler to sample_handler and set the new
    * invalid handler to SIGFPE_ABORT (abort on invalid)
    */
    hdl = (sigfpe_handler_type) sample_handler;
    old_handler1 = sigfpe(FPE_FLTOVF_TRAP, hdl);
    old_handler2 = sigfpe(FPE_FLTOPERR_TRAP, SIGFPE_ABORT);
    ...
    /*
    * restore old overflow and invalid handlers
    */
    sigfpe(FPE_FLTOVF_TRAP, old_handler1);
    sigfpe(FPE_FLTOPERR_TRAP, old_handler2);
}
```

**FILES**

`/usr/include/floatinglepoint.h`
`/usr/include/signal.h`
SEE ALSO


RETURN VALUE

sigfpe returns BADSIG if code is not zero or a defined SIGFPE code.
siginterrupt(3)

NAME
siginterrupt - allow signals to interrupt system calls

SYNOPSIS
cc [ flag... ] file ... -lucb
int siginterrupt(sig, flag)
int sig, flag;

DESCRIPTION
siginterrupt is used to change the system call restart behavior when a system
call is interrupted by the specified signal. If the flag is false (0), then system calls
will be restarted if they are interrupted by the specified signal and no data has
been transferred yet. System call restart is the default behavior when the sig-

nal(3) routine is used.

If the flag is true (1), then restarting of system calls is disabled. If a system call is
interrupted by the specified signal and no data has been transferred, the system
call will return -1 with errno set to EINTR. Interrupted system calls that have
started transferring data will return the amount of data actually transferred.
Issuing a siginterrupt call during the execution of a signal handler will cause
the new action to take place on the next signal to be caught.

NOTES
This library routine uses an extension of the sigvec(2) system call that is not
available in 4.2BSD, hence it should not be used if backward compatibility is
needed.

RETURN VALUE
A 0 value indicates that the call succeeded. A -1 value indicates that an invalid
signal number has been supplied.

SEE ALSO
sigblock(3), sigpause(3), sigsetmask(3), sigvec(3), signal(3).
NAME

signal - simplified software signal facilities

SYNOPSIS

cc [ flag... ] file ... -lucb
#include <signal.h>
void (*signal(sig, func))()
void (*func)();

DESCRIPTION

signal is a simplified interface to the more general sigvec(2) facility. Programs that use signal in preference to sigvec are more likely to be portable to all systems.

A signal is generated by some abnormal event, initiated by a user at a terminal (quit, interrupt, stop), by a program error (bus error, etc.), by request of another program (kill), or when a process is stopped because it wishes to access its control terminal while in the background [see termio(4)]. Signals are optionally generated when a process resumes after being stopped, when the status of child processes changes, or when input is ready at the control terminal. Most signals cause termination of the receiving process if no action is taken; some signals instead cause the process receiving them to be stopped, or are simply discarded if the process has not requested otherwise. Except for the SIGKILL and SIGSTOP signals, the signal call allows signals either to be ignored or to interrupt to a specified location. The following is a list of all signals with names as in the include file <signal.h>:

<table>
<thead>
<tr>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGHUP</td>
<td>hangup</td>
</tr>
<tr>
<td>SIGINT</td>
<td>interrupt</td>
</tr>
<tr>
<td>SIGQUIT</td>
<td>quit</td>
</tr>
<tr>
<td>SIGILL</td>
<td>illegal instruction</td>
</tr>
<tr>
<td>SIGTRAP</td>
<td>trace trap</td>
</tr>
<tr>
<td>SIGABRT</td>
<td>abort (generated by abort(3) routine)</td>
</tr>
<tr>
<td>SIGEMT</td>
<td>emulator trap</td>
</tr>
<tr>
<td>SIGFPE</td>
<td>arithmetic exception</td>
</tr>
<tr>
<td>SIGKILL</td>
<td>kill (cannot be caught, blocked, or ignored)</td>
</tr>
<tr>
<td>SIGBUS</td>
<td>bus error</td>
</tr>
<tr>
<td>SIGSEGV</td>
<td>segmentation violation</td>
</tr>
<tr>
<td>SIGSYS</td>
<td>bad argument to system call</td>
</tr>
<tr>
<td>SIGPIPE</td>
<td>write on a pipe or other socket with no one to read it</td>
</tr>
<tr>
<td>SIGALRM</td>
<td>alarm clock</td>
</tr>
<tr>
<td>SIGTERM</td>
<td>software termination signal</td>
</tr>
<tr>
<td>SIGURG</td>
<td>urgent condition present on socket</td>
</tr>
<tr>
<td>SIGSTOP</td>
<td>stop (cannot be caught, blocked, or ignored)</td>
</tr>
<tr>
<td>SIGTSTP</td>
<td>stop signal generated from keyboard</td>
</tr>
<tr>
<td>SIGCONT</td>
<td>continue after stop (cannot be blocked)</td>
</tr>
<tr>
<td>SIGCHLD</td>
<td>child status has changed</td>
</tr>
<tr>
<td>SIGTTIN</td>
<td>background read attempted from control terminal</td>
</tr>
<tr>
<td>SIGTTOU</td>
<td>background write attempted to control terminal</td>
</tr>
<tr>
<td>SIGIO</td>
<td>I/O is possible on a descriptor [see fcnt1(2)]</td>
</tr>
<tr>
<td>SIGXCPU</td>
<td>cpu time limit exceeded [see getrlimit(2)]</td>
</tr>
</tbody>
</table>
SIGXFSZ  * file size limit exceeded [see getrlimit(2)]
SIGVTALRM virtual time alarm [see getitimer(2)]
SIGPROF   profiling timer alarm [see getitimer(2)]
SIGWINCH  * window changed [see termio(4)]
SIGUSR1   user-defined signal 1
SIGUSR2   user-defined signal 2

The starred signals in the list above cause a core image if not caught or ignored.

If *func* is SIG_DFL, the default action for signal *sig* is reinstated; this default is termination (with a core image for starred signals) except for signals marked with * or †. Signals marked with * are discarded if the action is SIG_DFL; signals marked with † cause the process to stop. If *func* is SIG_IGN the signal is subsequently ignored and pending instances of the signal are discarded. Otherwise, when the signal occurs further occurrences of the signal are automatically blocked and *func* is called.

A return from the function unblocks the handled signal and continues the process at the point it was interrupted.

If a caught signal occurs during certain system calls, terminating the call prematurely, the call is automatically restarted. In particular this can occur during a read(2) or write(2) on a slow device (such as a terminal; but not a file) and during a wait(2).

The value of *signal* is the previous (or initial) value of *func* for the particular signal.

After a fork(2) or vfork(2) the child inherits all signals. An execve(2) resets all caught signals to the default action; ignored signals remain ignored.

**NOTES**

The handler routine can be declared:

```c
void handler(sig, code, scp, addr)
int sig, code;
struct sigcontext *scp;
char *addr;
```

Here *sig* is the signal number; *code* is a parameter of certain signals that provides additional detail; *scp* is a pointer to the sigcontext structure (defined in `<signal.h>`), used to restore the context from before the signal; and *addr* is additional address information. See sigvec(2) for more details.

**RETURN VALUE**

The previous action is returned on a successful call. Otherwise, -1 is returned and errno is set to indicate the error.

**ERRORS**

*signal* will fail and no action will take place if one of the following occur:

EINVAL  *sig* is not a valid signal number, or is SIGKILL or SIGSTOP.

**SEE ALSO**

setjmp(3), sigblock(3), sigpause(3), sigsetmask(3), sigstack(3), sigvec(3), wait(3)
execve(2), fork(2), getitimer(2), getrlimit(2), kill(2), ptrace(2), read(2),
  sigaction(2) wait(2), write(2), setjmp(3C), in the *Programmer's Reference Manual*.
termio(7) in the *System Administrator's Reference Manual*. 
NAME
sigpause - automatically release blocked signals and wait for interrupt

SYNOPSIS
cc [ flag... ] file ... -lucb
sigpause(sigmask)
int sigmask;

DESCRIPTION
sigpause assigns sigmask to the set of masked signals and then waits for a signal to arrive; on return the set of masked signals is restored. sigmask is usually 0 to indicate that no signals are now to be blocked. sigpause always terminates by being interrupted, returning EINTR.

In normal usage, a signal is blocked using sigblock(3), to begin a critical section, variables modified on the occurrence of the signal are examined to determine that there is no work to be done, and the process pauses awaiting work by using sigpause with the mask returned by sigblock.

SEE ALSO
sigblock(3), sigvec(3), signal(3)
NAME
sigsetmask — set current signal mask

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <signal.h>

sigsetmask(mask);
int mask;
#define sigmask(signum)

DESCRIPTION
sigsetmask sets the current signal mask (those signals that are blocked from
delivery). Signals are blocked if the corresponding bit in mask is a 1; the macro
sigmask is provided to construct the mask for a given signum.
The system quietly disallows SIGKILL, SIGSTOP, or SIGCONT from being blocked.

RETURN VALUE
The previous set of masked signals is returned.

SEE ALSO
sigblock(3), sigpause(3), sigvec(3), signal(3)
sigstack(3)

NAME
sigstack - set and/or get signal stack context

SYNOPSIS
cc [ flag ... ] file ... -lucb
#include <signal.h>

int sigstack (ss, oss)
struct sigstack *ss, *oss;

DESCRIPTION
sigstack allows users to define an alternate stack, called the "signal stack", on
which signals are to be processed. When a signal's action indicates its handler
should execute on the signal stack (specified with a sigvec(2) call), the system
checks to see if the process is currently executing on that stack. If the process is
not currently executing on the signal stack, the system arranges a switch to the
signal stack for the duration of the signal handler's execution.

A signal stack is specified by a sigstack structure, which includes the following
members:

char *ss_sp; /* signal stack pointer */
int ss_onstack; /* current status */

ss_sp is the initial value to be assigned to the stack pointer when the system
switches the process to the signal stack. Note that, on machines where the stack
grows downwards in memory, this is not the address of the beginning of the sig­
nal stack area. ss_onstack field is zero or non-zero depending on whether the
process is currently executing on the signal stack or not.

If ss is not a NULL pointer, sigstack sets the signal stack state to the value in the
sigstack structure pointed to by ss. Note: if ss_onstack is non-zero, the sys­
tem will think that the process is executing on the signal stack. If ss is a NULL
pointer, the signal stack state will be unchanged. If oss is not a NULL pointer, the
current signal stack state is stored in the sigstack structure pointed to by oss.

RETURN VALUE
Upon successful completion, a value of 0 is returned. Otherwise, a value of -1 is
returned and errno is set to indicate the error.

ERRORS
sigstack will fail and the signal stack context will remain unchanged if one of
the following occurs.

EFAULT Either ss or oss points to memory that is not a valid part of the
process address space.

SEE ALSO
sigvec(3), signal(3)

NOTES
Signal stacks are not "grown" automatically, as is done for the normal stack. If
the stack overflows unpredictable results may occur.
NAME
sigvec - software signal facilities

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <signal.h>
int sigvec(sig, vec, ovec)
int sig;
struct sigvec *vec, *ovec;

DESCRIPTION
The system defines a set of signals that may be delivered to a process. Signal
delivery resembles the occurrence of a hardware interrupt: the signal is blocked
from further occurrence, the current process context is saved, and a new one is
built. A process may specify a handler to which a signal is delivered, or specify
that a signal is to be blocked or ignored. A process may also specify that a default
action is to be taken by the system when a signal occurs. Normally, signal
handlers execute on the current stack of the process. This may be changed, on a
per-handler basis, so that signals are taken on a special signal stack.

All signals have the same priority. Signal routines execute with the signal that
caused their invocation to be blocked, but other signals may yet occur. A global
signal mask defines the set of signals currently blocked from delivery to a process.
The signal mask for a process is initialized from that of its parent (normally 0). It
may be changed with a sigblock(3) or sigsetmask(3) call, or when a signal is
delivered to the process.

A process may also specify a set of flags for a signal that affect the delivery of
that signal.

When a signal condition arises for a process, the signal is added to a set of sig­
nals pending for the process. If the signal is not currently blocked by the process
then it is delivered to the process. When a signal is delivered, the current state of
the process is saved, a new signal mask is calculated (as described below), and
the signal handler is invoked. The call to the handler is arranged so that if the
signal handling routine returns normally the process will resume execution in the
context from before the signal's delivery. If the process wishes to resume in a
different context, then it must arrange to restore the previous context itself.

When a signal is delivered to a process a new signal mask is installed for the
duration of the process' signal handler (or until a sigblock or sigsetmask call is
made). This mask is formed by taking the current signal mask, adding the signal
to be delivered, and ORing in the signal mask associated with the handler to be
invoked.

The action to be taken when the signal is delivered is specified by a sigvec struc­
ture, which includes the following members:

void (*sv_handler)(); /* signal handler */
int sv_mask; /* signal mask to apply */
int sv_flags; /* see signal options */
#define SV_ONSTACK /* take signal on signal stack */
#define SV_INTERRUPT /* do not restart system on signal return */
#define SV_RESETHAND /* reset handler to SIG_DFL when signal taken */

If the **SV_ONSTACK** bit is set in the flags for that signal, the system will deliver the signal to the process on the signal stack specified with **sigstack(2)**, rather than delivering the signal on the current stack.

If **vec** is not a NULL pointer, **sigvec** assigns the handler specified by **sv_handler**, the mask specified by **sv_mask**, and the flags specified by **sv_flags** to the specified signal. If **vec** is a NULL pointer, **sigvec** does not change the handler, mask, or flags for the specified signal.

The mask specified in **vec** is not allowed to block **SIGKILL**, **SIGSTOP**, or **SIGCONT**. The system enforces this restriction silently.

If **ovec** is not a NULL pointer, the handler, mask, and flags in effect for the signal before the call to **sigvec** are returned to the user. A call to **sigvec** with **vec** a NULL pointer and **ovec** not a NULL pointer can be used to determine the handling information currently in effect for a signal without changing that information.

The following is a list of all signals with names as in the include file **/usr/include/signal.h**:

- **SIGHUP** hangup
- **SIGINT** interrupt
- **SIGQUIT** quit
- **SIGILL** illegal instruction
- **SIGTRAP** trace trap
- **SIGABRT** abort (generated by **abort(3)** routine)
- **SIGEMT** emulator trap
- **SIGFPE** arithmetic exception
- **SIGKILL** kill (cannot be caught, blocked, or ignored)
- **SIGBUS** bus error
- **SIGSEGV** segmentation violation
- **SIGSYS** bad argument to system call
- **SIGPIPE** write on a pipe or other socket with no one to read it
- **SIGALRM** alarm clock
- **SIGTERM** software termination signal
- **SIGURG** urgent condition present on socket
- **SIGSTOP** stop (cannot be caught, blocked, or ignored)
- **SIGTSTP** stop signal generated from keyboard
- **SIGCONT** continue after stop (cannot be blocked)
- **SIGCHLD** child status has changed
- **SIGTIN** background read attempted from control terminal
- **SIGTTOU** background write attempted to control terminal
- **SIGIO** I/O is possible on a descriptor [see **fcntl(2)**]
- **SIGXCPU** cpu time limit exceeded [see **setrlimit(2)**]
- **SIGXFSZ** file size limit exceeded [see **setrlimit(2)**]
- **SIGVTALRM** virtual time alarm [see **setitimer(2)**]
- **SIGPROF** profiling timer alarm [see **setitimer(2)**]
- **SIGWINCH** window changed [see **termio(4)**]
- **SIGUSR1** user-defined signal 1
SIGUSR2  user-defined signal 2

The starred signals in the list above cause a core image if not caught or ignored.

Once a signal handler is installed, it remains installed until another sigvec call is made, or an execve(2) is performed, unless the SV_RESETHAND bit is set in the flags for that signal. In that case, the value of the handler for the caught signal will be set to SIG_DFL before entering the signal-catching function, unless the signal is SIGILL, SIGPWR, or SIGTRAP. Also, if this bit is set, the bit for that signal in the signal mask will not be set; unless the signal mask associated with that signal blocks that signal, further occurrences of that signal will not be blocked. The SV_RESETHAND flag is not available in 4.2BSD, hence it should not be used if backward compatibility is needed.

The default action for a signal may be reinstated by setting the signal’s handler to SIG_DFL; this default is termination except for signals marked with • or t. Signals marked with • are discarded if the action is SIG_DFL; signals marked with t cause the process to stop. If the process is terminated, a “core image” will be made in the current working directory of the receiving process if the signal is one for which an asterisk appears in the above list [see core(4)].

If the handler for that signal is SIG_IGN, the signal is subsequently ignored, and pending instances of the signal are discarded.

If a caught signal occurs during certain system calls, the call is normally restarted. The call can be forced to terminate prematurely with an EINTR error return by setting the SV_INTERRUPT bit in the flags for that signal. The SV_INTERRUPT flag is not available in 4.2BSD, hence it should not be used if backward compatibility is needed. The affected system calls are read(2) or write(2) on a slow device (such as a terminal or pipe or other socket, but not a file) and during a wait(2).

After a fork(2) or vfork(2) the child inherits all signals, the signal mask, the signal stack, and the restart/interrupt and reset-signal-handler flags.

The execve(2) call resets all caught signals to default action and resets all signals to be caught on the user stack. Ignored signals remain ignored; the signal mask remains the same; signals that interrupt system calls continue to do so.

The accuracy of addr is machine dependent. For example, certain machines may supply an address that is on the same page as the address that caused the fault. If an appropriate addr cannot be computed it will be set to SIG_NOADDR.

RETURN VALUE
A 0 value indicates that the call succeeded. A -1 return value indicates that an error occurred and errno is set to indicate the reason.

ERRORS
sigvec will fail and no new signal handler will be installed if one of the following occurs:

EFAULT Either vec or ovec is not a NULL pointer and points to memory that is not a valid part of the process address space.
EINVAL

Sig is not a valid signal number, or, SIGKILL, or SIGSTOP.

SEE ALSO

signal(3), sigpause(3), sigsetmask(3), wait(3).
exec(2), fcntl(2), fork(2), getrlimit(2), getitimer(2), ioctl(2), kill(2),
ptrace(2), read(2), sigblock(2), signal(2), sigstack(2), umask(2), wait(2),

NOTES

SIGPOLL is a synonym for SIGIO. A SIGIO will be issued when a file descriptor corresponding to a STREAMS [see intro(2)] file has a “selectable” event pending. Unless that descriptor has been put into asynchronous mode [see fcntl(2)], a process must specifically request that this signal be sent using the I_SETSIG ioctl call [see streamio(4)]. Otherwise, the process will never receive SIGPOLL.

The handler routine can be declared:

```c
void handler(sig, code, scp, addr)
    int sig, code;
    struct sigcontext *scp;
    char *addr;
```

Here `sig` is the signal number; `code` is a parameter of certain signals that provides additional detail; `scp` is a pointer to the `sigcontext` structure (defined in `signal.h`), used to restore the context from before the signal; and `addr` is additional address information.

The signals SIGKILL, SIGSTOP, and SIGCONT cannot be ignored.
NAME
sleep - suspend execution for interval

SYNOPSIS
cc [ flag... ] file ... -lucb
sleep(seconds)
unsigned seconds;

DESCRIPTION
sleep suspends the current process from execution for the number of seconds
specified by the argument. The actual suspension time may be up to 1 second
less than that requested, because scheduled wakeups occur at fixed 1-second
intervals, and may be an arbitrary amount longer because of other activity in the
system.

sleep is implemented by setting an interval timer and pausing until it expires.
The previous state of this timer is saved and restored. If the sleep time exceeds
the time to the expiration of the previous value of the timer, the process sleeps
only until the timer would have expired, and the signal which occurs with the
expiration of the timer is sent one second later.

SEE ALSO
sigpause(3), usleep(3)
getime(2) in the Programmer's Reference Manual
NAME

string: strcasecmp, strncasecmp - string operations

SYNOPSIS

cc [ flag ... ] file ... -lucb

int strcasecmp(s1, s2)
char *s1, *s2;

int strncasecmp(s1, s2, n)
char *s1, *s2;
int n;

DESCRIPTION

The strcasecmp and strncasecmp routines compare the strings and ignore
differences in case. These routines assume the ASCII character set when equating
lower and upper case characters.

These functions operate on null-terminated strings. They do not check for
overflow of any receiving string.

SEE ALSO

bstring(3)
malloc(3C), string(3C) in the Programmer's Reference Manual.

NOTES

strcasecmp and strncasecmp use native character comparison as above and
assume the ASCII character set.
NAME
syscall - indirect system call

SYNOPSIS
cc [ flag... ] file ... -lcub
#include <sys/syscall.h>
int syscall(number, arg, ...)

DESCRIPTION
syscall performs the system call whose assembly language interface has the
specified number, and arguments arg .... Symbolic constants for system calls can
be found in the header file /usr/include/sys/syscall.h.

RETURN VALUE
When the C-bit is set, syscall returns -1 and sets the external variable errno
(see intro(2)).

SEE ALSO
NAME
syslog, openlog, closelog, setlogmask — control system log

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <syslog.h>
openlog(ident, logopt, facility)
char *ident;
syslog(priority, message, parameters ...)
char *message;
closelog()
setlogmask(maskpri)

DESCRIPTION
syslog passes message to syslogd(1M), which logs it in an appropriate system log, writes it to the system console, forwards it to a list of users, or forwards it to the syslogd on another host over the network. The message is tagged with a priority of priority. The message looks like a printf(3S) string except that %m is replaced by the current error message (collected from errno). A trailing NEWLINE is added if needed.

Priorities are encoded as a facility and a level. The facility describes the part of the system generating the message. The level is selected from an ordered list:

- LOG_EMERG  A panic condition. This is normally broadcast to all users.
- LOG_ALERT   A condition that should be corrected immediately, such as a corrupted system database.
- LOG_CRIT    Critical conditions, such as hard device errors.
- LOG_ERR     Errors.
- LOG_WARNING Warning messages.
- LOG_NOTICE  Conditions that are not error conditions, but that may require special handling.
- LOG_INFO    Informational messages.
- LOG_DEBUG   Messages that contain information normally of use only when debugging a program.

If special processing is needed, openlog can be called to initialize the log file. The parameter ident is a string that is prepended to every message. logopt is a bit field indicating logging options. Current values for logopt are:

- LOG_PID     Log the process ID with each message. This is useful for identifying specific daemon processes (for daemons that fork).
- LOG_CONS    Write messages to the system console if they cannot be sent to syslogd. This option is safe to use in daemon processes that have no controlling terminal, since syslog forks before opening the console.
Open the connection to syslogd immediately. Normally the open is delayed until the first message is logged. This is useful for programs that need to manage the order in which file descriptors are allocated.

Do not wait for child processes that have been forked to log messages onto the console. This option should be used by processes that enable notification of child termination using SIGCHLD, since syslog may otherwise block waiting for a child whose exit status has already been collected.

The facility parameter encodes a default facility to be assigned to all messages that do not have an explicit facility already encoded:

- **LOG_KERN** Messages generated by the kernel. These cannot be generated by any user processes.
- **LOG_USER** Messages generated by random user processes. This is the default facility identifier if none is specified.
- **LOG_MAIL** The mail system.
- **LOG_DAEMON** System daemons, such as ftpd(1M), routed(1M), etc.
- **LOG_AUTH** The authorization system: login(1), su(1), getty(1M), etc.
- **LOG_LPR** The line printer spooling system: lpr(1), lpc(1M), etc.
- **LOG_NEWS** Reserved for the USENET network news system.
- **LOG_UUCP** Reserved for the UUCP system; it does not currently use syslog.
- **LOG_CRON** The cron/at facility; crontab(1), at(1), cron(1M), etc.
- **LOG_LOCAL0-7** Reserved for local use.

Closelog can be used to close the log file.

Setlogmask sets the log priority mask to maskpri and returns the previous mask. Calls to syslog with a priority not set in maskpri are rejected. The mask for an individual priority pri is calculated by the macro LOG_MASK(pri); the mask for all priorities up to and including toppri is given by the macro LOG_UPTO(toppri). The default allows all priorities to be logged.

**EXAMPLE**

This call logs a message at priority LOG_ALERT:

```c
syslog(LOG_ALERT, "who: internal error 23");
```
The FTP daemon, `ftpd`, would make this call to `openlog` to indicate that all messages it logs should have an identifying string of `ftpd`, should be treated by `syslogd` as other messages from system daemons are, and should include the process ID of the process logging the message:

```
openlog("ftpd", LOG_PID, LOG_DAEMON);
```

Then it would make the following call to `setlogmask` to indicate that messages at priorities from `LOG_EMERG` through `LOG_ERR` should be logged, but that no messages at any other priority should be logged:

```
setlogmask (LOG_UPTO(LOG_ERR));
```

Then, to log a message at priority `LOG_INFO`, it would make the following call to `syslog`:

```
syslog(LOG_INFO, "Connection from host %d", CallingHost);
```

A locally-written utility could use the following call to `syslog` to log a message at priority `LOG_INFO`, to be treated by `syslogd` as other messages to the facility `LOG_LOCAL2` are treated:

```
syslog(LOG_INFO|LOG_LOCAL2, "error: %m");
```

SEE ALSO

`logger(1), login(1), lpr(1), lpc(1M), syslogd(1M), printf(3S)`


`ftpd(1M), routed(1M)` in the `Network User's and Administrator's Guide`.

`getty(1M), cron(1M), su(1), printf(3S)` in the `System Administrator's Reference Manual`. 
NAME
times — get process times

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <sys/types.h>
#include <sys/times.h>
times(buffer)
struct tms *buffer;

DESCRIPTION
times returns time-accounting information for the current process and for the terminated child processes of the current process. All times are in 1/HZ seconds, where HZ is 60.

This is the structure returned by times:
struct tms {
    time_t tms_utime; /* user time */
    time_t tms_stime; /* system time */
    time_t tms_cutime; /* user time, children */
    time_t tms_cstime; /* system time, children */
};

The children’s times are the sum of the children’s process times and their children’s times.

SEE ALSO
getrusage(3), wait(3), time(3)
wait(2) in the Programmer’s Reference Manual

NOTES
times has been superseded by getrusage.
NAME

timezone - get time zone name given offset from GMT

SYNOPSIS

c [ flag... ] file ... -lucb

char *timezone(zone, dst)

int zone

int dst

DESCRIPTION

timezone attempts to return the name of the time zone associated with its first argument, which is measured in minutes westward from Greenwich. If the second argument is 0, the standard name is used, otherwise the Daylight Savings Time version. If the required name does not appear in a table built into the routine, the difference from GMT is produced; for instance, in Afghanistan timezone(-60*4+30), 0) is appropriate because it is 4:30 ahead of GMT and the string GMT+4:30 is produced.

SEE ALSO


NOTES

The offset westward from Greenwich and an indication of whether Daylight Savings Time is in effect may not be sufficient to determine the name of the time zone, as the name may differ between different locations in the same time zone. Instead of using timezone to determine the name of the time zone for a given time, that time should be converted to a struct tm using localtime [see ctime(3)] and the tm_zone field of that structure should be used. timezone is retained for compatibility with existing programs.
NAME
ualarm - schedule signal after interval in microseconds

SYNOPSIS
cc [ flag...] file ... -lucb
unsigned ualarm(value, interval)
unsigned value;
unsigned interval;

DESCRIPTION
ualarm sends signal SIGALRM [see signal(3)], to the invoking process in a
number of microseconds given by the value argument. Unless caught or ignored,
the signal terminates the process.

If the interval argument is non-zero, the SIGALRM signal will be sent to the process
every interval microseconds after the timer expires (for instance, after value
microseconds have passed).

Because of scheduling delays, resumption of execution of when the signal is
cought may be delayed an arbitrary amount. The longest specifiable delay time is
2147483647 microseconds.

The return value is the amount of time previously remaining in the alarm clock.

NOTES
ualarm is a simplified interface to setitimer; see getitimer(2).

SEE ALSO
sigpause(3), sigvec(3), signal(3), sleep(3), usleep(3)
NAME
  usleep - suspend execution for interval in microseconds

SYNOPSIS
  cc [ flag... ] file ... -lucb
  usleep(useconds)
  unsigned useconds;

DESCRIPTION
  Suspend the current process for the number of microseconds specified by the argument. The actual suspension time may be an arbitrary amount longer because of other activity in the system, or because of the time spent in processing the call.

  The routine is implemented by setting an interval timer and pausing until it occurs. The previous state of this timer is saved and restored. If the sleep time exceeds the time to the expiration of the previous timer, the process sleeps only until the signal would have occurred, and the signal is sent a short time later.

  This routine is implemented using setitimer [see getitimer(2)]; it requires eight system calls each time it is invoked.

SEE ALSO
  sigpause(3), sleep(3), ualarm(3).
utimes(3)

NAME
    utimes - set file times

SYNOPSIS
    cc [ flag... ] file ... -lucb
    #include <sys/types.h>
    int utimes(file, tvp)
    char *file;
    struct timeval *tvp;

DESCRIPTION
    utimes sets the access and modification times of the file named by file.

    If tvp is NULL, the access and modification times are set to the current time. A
    process must be the owner of the file or have write permission for the file to use
    utimes in this manner.

    If tvp is not NULL, it is assumed to point to an array of two timeval structures.
    The access time is set to the value of the first member, and the modification time
    is set to the value of the second member. Only the owner of the file or the
    privileged user may use utimes in this manner.

    In either case, the inode-changed time of the file is set to the current time.

RETURN VALUE
    Upon successful completion, a value of 0 is returned. Otherwise, a value of -1 is
    returned and errno is set to indicate the error.

ERRORS
    utimes will fail if one or more of the following are true:

    ENOTDIR    A component of the path prefix of file is not a directory.
    ENAMETOOLONG The length of a component of file exceeds 255 characters, or
                   the length of file exceeds 1023 characters.
    ENOENT     The file referred to by file does not exist.
    EACCES     Search permission is denied for a component of the path
                prefix of file.
    ELOOP      Too many symbolic links were encountered in translating
                file.
    EPERM      The effective user ID of the process is not privileged user
                and not the owner of the file, and tvp is not NULL.
    EACCES     The effective user ID of the process is not privileged user
                and not the owner of the file, write permission is denied for
                the file, and tvp is NULL.
    EIO         An I/O error occurred while reading from or writing to the
                file system.
    EROFS      The file system containing the file is mounted read-only.
utimes(3)

EFAULT

file or top points outside the process’s allocated address space.

SEE ALSO

NOTES
utimes is a library routine that calls the utime system call.
NAME
wait, wait3, WIFSTOPPED, WIFSIGNALED, WIFEXITED — wait for process to terminate or stop

SYNOPSIS
cc [ flag... ] file ... -lucb
#include <sys/wait.h>
int wait(statusp)
union wait *statusp;
#include <sys/time.h>
#include <sys/resource.h>
int wait3(statusp, options, rusage)
union wait *statusp;
int options;
struct rusage *rusage;
WIFSTOPPED(status)
union wait status;
WIFSIGNALED(status)
union wait status;
WIFEXITED(status)
union wait status;

DESCRIPTION
wait delays its caller until a signal is received or one of its child processes terminates or stops due to tracing. If any child has died or stopped due to tracing and this has not been reported using wait, return is immediate, returning the process ID and exit status of one of those children. If that child had died, it is discarded. If there are no children, return is immediate with the value -1 returned. If there are only running or stopped but reported children, the calling process is blocked.

If status is not a NULL pointer, then on return from a successful wait call the status of the child process whose process ID is the return value of wait is stored in the wait union pointed to by status. The w_status member of that union is an int; it indicates the cause of termination and other information about the terminated process in the following manner:

- If the low-order 8 bits of w_status are equal to 0177, the child process has stopped; the 8 bits higher up from the low-order 8 bits of w_status contain the number of the signal that caused the process to stop. See ptrace(2) and sigvec(3).
- If the low-order 8 bits of w_status are non-zero and are not equal to 0177, the child process terminated due to a signal; the low-order 7 bits of w_status contain the number of the signal that terminated the process. In addition, if the low-order seventh bit of w_status (that is, bit 0200) is set, a “core image” of the process was produced; see sigvec(3).
• Otherwise, the child process terminated due to an exit call; the 8 bits higher up from the low-order 8 bits of word_status contain the low-order 8 bits of the argument that the child process passed to exit; see exit(2).

Other members of the wait union can be used to extract this information more conveniently:

• If the stopval member has the value WSTOPPED, the child process has stopped; the value of the stopsig member is the signal that stopped the process.

• If the term.sig member is non-zero, the child process terminated due to a signal; the value of the term.sig member is the number of the signal that terminated the process. If the coredump member is non-zero, a core dump was produced.

• Otherwise, the child process terminated due to an exit call; the value of the retcode member is the low-order 8 bits of the argument that the child process passed to exit.

The other members of the wait union merely provide an alternate way of analyzing the status. The value stored in the status field is compatible with the values stored by other versions of the UNIX system, and an argument of type int * may be provided instead of an argument of type union wait * for compatibility with those versions.

wait3 is an alternate interface that allows both non-blocking status collection and the collection of the status of children stopped by any means. The status parameter is defined as above. The options parameter is used to indicate the call should not block if there are no processes that have status to report (WNOHANG), and/or that children of the current process that are stopped due to a SIGTTIN, SIGSTOP, SIGTSTP, or SIGSTOP signal are eligible to have their status reported as well (WUNTRACED). A terminated child is discarded after it reports status, and a stopped process will not report its status more than once. If rusage is not a NULL pointer, a summary of the resources used by the terminated process and all its children is returned. Only the user time used and the system time used are currently available. They are returned in rusage.ru_utime and rusage.ru_stime, respectively.

When the WNOHANG option is specified and no processes have status to report, wait3 returns 0. The WNOHANG and WUNTRACED options may be combined by ORing the two values.

WIFSTOPPED, WIFSIGNALED, WIFEXITED, are macros that take an argument status, of type union wait, as returned by wait, or wait3. WIFSTOPPED evaluates to true (1) when the process for which the wait call was made is stopped, or to false (0) otherwise. WIFSIGNALED evaluates to true when the process was terminated with a signal. WIFEXITED evaluates to true when the process exited by using an exit(2) call.

**RETURN VALUE**

If wait returns due to a stopped or terminated child process, the process ID of the child is returned to the calling process. Otherwise, a value of -1 is returned and errno is set to indicate the error.
wait3 returns 0 if WNOHANG is specified and there are no stopped or exited children, and returns the process ID of the child process if it returns due to a stopped or terminated child process. Otherwise, wait3 returns a value of -1 and sets errno to indicate the error.

**ERRORS**
wait, or wait3 will fail and return immediately if one or more of the following are true:
- ECHILD: The calling process has no existing unwaited-for child processes.
- EFAULT: The status or rusage arguments point to an illegal address.

wait, and wait3 will terminate prematurely, return -1, and set errno to EINTR upon the arrival of a signal whose SV_INTERRUPT bit in its flags field is set [see sigvec(3) and siginterrupt(3)]. signal(3), in the System V compatibility library, sets this bit for any signal it catches.

**SEE ALSO**
sigvec(3), getrusage(3), siginterrupt(3), signal(3)
exit(2), ptrace(2), signal(2) wait(2), waitpid(2) in the Programmer's Reference Manual.

**NOTES**
If a parent process terminates without waiting on its children, the initialization process (process ID = 1) inherits the children.

wait, and wait3 are automatically restarted when a process receives a signal while awaiting termination of a child process, unless the SV_INTERRUPT bit is set in the flags for that signal.

**WARNINGS**
Calls to wait with an argument of 0 should be cast to type 'union wait *', as in:

```c
wait((union wait *)0)
```
Otherwise lint will complain.
NAME

aliases, addresses, forward – addresses and aliases for sendmail

SYNOPSIS

/etc/aliases
/etc/aliases.dir
/etc/aliases.pag
~/.forward

DESCRIPTION

These files contain mail addresses or aliases, recognized by sendmail, for the
local host:

/etc/passwd Mail addresses (usernames) of local users.
/etc/aliases Aliases for the local host, in ASCII format. This file can be
edited to add, update, or delete local mail aliases.

/etc/aliases. { dir, pag}
The aliasing information from /etc/aliases, in binary,
dbm format for use by sendmail. The program
newaliases, which is invoked automatically by sendmail,
maintains these files.

~/.forward Addresses to which a user’s mail is forwarded (see
Automatic Forwarding, below).

In addition, the YP name services aliases map mail.aliases contains addresses and
aliases available for use across the network.

Addresses
As distributed, sendmail supports the following types of addresses:

Local Usernames

username

Each local username is listed in the local host’s /etc/passwd file.

Local Filenames

pathname

Messages addressed to the absolute pathname of a file are appended to that file.

Commands

| command

If the first character of the address is a vertical bar, (|), sendmail pipes the mes-
sage to the standard input of the command the bar precedes.

DARPA-standard Addresses

username@domain

If domain does not contain any ‘.’ (dots), then it is interpreted as the name of a
host in the current domain. Otherwise, the message is passed to a mailhost that
determines how to get to the specified domain. Domains are divided into sub-
domains separated by dots, with the top-level domain on the right. Top-level
domains include:
.COM  Commercial organizations.
.EDU   Educational organizations.
.GOV   Government organizations.
.MIL   Military organizations.

For example, the full address of John Smith could be:

```
js@jsmachine.Podunk-u.EDU
```

if he uses the machine named jsmachine at Podunk University.

**uucp Addresses**

```
... [host!] host! username
```

These are sometimes mistakenly referred to as "Usenet" addresses. uucp provides links to numerous sites throughout the world for the remote copying of files.

Other site-specific forms of addressing can be added by customizing the `sendmail` configuration file. See the `sendmail(1M)` for details. Standard addresses are recommended.

**Aliases**

**Local Aliases**

/`etc/aliases` is formatted as a series of lines of the form

```
aliasname: address[, address]
```

`aliasname` is the name of the alias or alias group, and `address` is the address of a recipient in the group. Aliases can be nested. That is, an `address` can be the name of another alias group. Because of the way `sendmail` performs mapping from upper-case to lower-case, an `address` that is the name of another alias group must not contain any upper-case letters.

Lines beginning with white space are treated as continuation lines for the preceding alias. Lines beginning with `#` are comments.

**Special Aliases**

An alias of the form:

```
owner- aliasname : address
```

directs error-messages resulting from mail to `aliasname` to `address`, instead of back to the person who sent the message.

An alias of the form:

```
aliasname : :include : pathname
```

with colons as shown, adds the recipients listed in the file `pathname` to the `aliasname` alias. This allows a private list to be maintained separately from the aliases file.

**YP Domain Aliases**

Normally, the aliases file on the master YP server is used for the `mailaliases` YP map, which can be made available to every YP client. Thus, the `/etc/aliases*` files on the various hosts in a network will one day be obsolete. Domain-wide aliases should ultimately be resolved into usernames on specific hosts. For
example, if the following were in the domain-wide alias file:

```
jsmith:js@jsmachine
```

then any YP client could just mail to jsmith and not have to remember the machine and username for John Smith. If a YP alias does not resolve to an address with a specific host, then the name of the YP domain is used. There should be an alias of the domain name for a host in this case. For example, the alias:

```
jsmith:root
```

sends mail on a YP client to root@podunk-u if the name of the YP domain is podunk-u.

### Automatic Forwarding

When an alias (or address) is resolved to the name of a user on the local host, sendmail checks for a `.forward` file, owned by the intended recipient, in that user's home directory, and with universal read access. This file can contain one or more addresses or aliases as described above, each of which is sent a copy of the user's mail.

Care must be taken to avoid creating addressing loops in the `.forward` file. When forwarding mail between machines, be sure that the destination machine does not return the mail to the sender through the operation of any YP aliases. Otherwise, copies of the message may "bounce." Usually, the solution is to change the YP alias to direct mail to the proper destination.

A backslash before a username inhibits further aliasing. For instance, to invoke the vacation program, user js creates a `.forward` file that contains the line:

```
\js, "1/usr/ucb/vacation js"
```

so that one copy of the message is sent to the user, and another is piped into the vacation program.

### FILES

- `/etc/passwd`
- `/etc/aliases`
- `~//.forward`

### SEE ALSO

- `newaliases(1M)`, `sendmail(1M)`, `vacation(1)`, `dbm(3X)`.
- `uucp(1C)`, in the *User's Reference Manual*.

### NOTES

Because of restrictions in `dbm` a single alias cannot contain more than about 1000 characters. Nested aliases can be used to circumvent this limit.
NAME
syslog.conf – configuration file for syslogd system log daemon

SYNOPSIS
/etc/syslog.conf

DESCRIPTION
The file /etc/syslog.conf contains information used by the system log daemon, syslogd(1M), to forward a system message to appropriate log files and/or users. syslog preprocesses this file through m4(1) to obtain the correct information for certain log files.

A configuration entry is composed of two TAB-separated fields:

"selector action"

The selector field contains a semicolon-separated list of priority specifications of the form:

facility.level [ ; facility.level ]

where facility is a system facility, or comma-separated list of facilities, and level is an indication of the severity of the condition being logged. Recognized values for facility include:

user Messages generated by user processes. This is the default priority for messages from programs or facilities not listed in this file.

kern Messages generated by the kernel.

mail The mail system.

daemon System daemons, such as ftpd(1M), routed(1M), etc.

auth The authorization system: login(1), su(1M), getty(1M), etc.

lpr The line printer spooling system: lpr(1), lpc(1M), lpd(1M), etc.

news Reserved for the USENET network news system.

uucp Reserved for the UUCP system; it does not currently use the syslog mechanism.

cron The cron /at facility; crontab(1), at(1), cron(1M), etc.

dc10–7 Reserved for local use.

mark For timestamp messages produced internally by syslogd.

* An asterisk indicates all facilities except for the mark facility.

Recognized values for level are (in descending order of severity):

emerg For panic conditions that would normally be broadcast to all users.

alert For conditions that should be corrected immediately, such as a corrupted system database.

crit For warnings about critical conditions, such as hard device errors.

err For other errors.
warning For warning messages.
notice For conditions that are not error conditions, but may require special handling.
info Informational messages.
debug For messages that are normally used only when debugging a program.
none Do not send messages from the indicated facility to the selected file.

For example, a selector of

`*.debug;mail.none`

will send all messages except mail messages to the selected file.

The action field indicates where to forward the message. Values for this field can have one of four forms:

- A filename, beginning with a leading slash, which indicates that messages specified by the selector are to be written to the specified file. The file will be opened in append mode.
- The name of a remote host, prefixed with an @, as with: `@server`, which indicates that messages specified by the selector are to be forwarded to the syslogd on the named host.
- A comma-separated list of usernames, which indicates that messages specified by the selector are to be written to the named users if they are logged in.
- An asterisk, which indicates that messages specified by the selector are to be written to all logged-in users.

Blank lines are ignored. Lines for which the first nonwhite character is a `#' are treated as comments.

**Example**

With the following configuration file:

```
*.notice;mail.info /var/log/notice
*.crit /var/log/critical
kern,mark.debug /dev/console
kern.err @server
*.emerg *
*.alert root,operator
*.alert;auth.warning /var/log/auth
```

syslogd will log all mail system messages except debug messages and all notice (or higher) messages into a file named `/var/log/notice`. It logs all critical messages into `/var/log/critical`, and all kernel messages and 20-minute marks onto the system console.

Kernel messages of `err` (error) severity or higher are forwarded to the machine named `server`. Emergency messages are forwarded to all users. The users root and operator are informed of any alert messages. All messages from the authorization system of warning level or higher are logged in the file `/var/log/auth`. 
FILES
/etc/syslog.conf
/var/log/notice
/var/log/critical
/var/log/auth

SEE ALSO
logger(1), lpr(1), syslogd(1M), syslog(3).
NAME
eqnchar – special character definitions for eqn

SYNOPSIS
eqn /usr/ucblib/pub/eqnchar [ filename ] | troff [ options ]
neqn /usr/ucblib/pub/eqnchar [ filename ] | nroff [ options ]

DESCRIPTION
The eqnchar command contains troff(l) and nroff(l) character definitions for constructing characters that are not available on the Graphic Systems typesetter. These definitions are primarily intended for use with eqn(l) and neqn. It contains definitions for the following characters:

ciplus ⊕ | |     square □
citimes ⊗ langle /     circle ○
wig ~ rangle \     blot □
-wig = hbar ‹     bullet •
>wig ≥ ppd ‖     prop ≡
<wig ≤ <->     empty Ø
=wig ≡ <>     member ε
star * <     nomem €
bigstar ⋆ >     cup ⊆
=dot ≡ ang /     cap ⊆
onsign ∨ rang !     incl ⊆
andsign ∧ 3dot :     subset ⊆
=del Δ thf .     supset ⊆
oppA ∨ quarter ¼     lsubset ⊆
oppE ≡ 3quarter ¼     lsupset ⊆
angstrom Å degree °

FILES
/usr/ucblib/pub/eqnchar

SEE ALSO
eqn(l), nroff(l), troff(l).
NAME
man – macros to format Reference Manual pages

SYNOPSIS
nroff -man filename...
troff -man filename...

DESCRIPTION
These macros are used to lay out the reference pages in this manual. Note: if.
filename contains format input for a preprocessor, the commands shown above.
must be piped through the appropriate preprocessor. This is handled automatically.
by man(1). See the “Conventions” section.

Any text argument t may be zero to six words. Quotes may be used to include.
SPACE characters in a word. If text is empty, the special treatment is applied to.
the next input line with text to be printed. In this way .I may be used to italicize.
a whole line, or .SB may be used to make small bold letters.

A prevailing indent distance is remembered between successive indented para-
graphs, and is reset to default value upon reaching a non-indented paragraph.
Default units for indents i are ens.

Type font and size are reset to default values before each paragraph, and after.
processing font and size setting macros.

These strings are predefined by -man:
\*R '®', '(Reg)' in nroff.
\*S Change to default type size.

Requests
* n.t.l. = next text line; p.i. = prevailing indent

<table>
<thead>
<tr>
<th>Request</th>
<th>Cause</th>
<th>If no</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>.B t</td>
<td>no</td>
<td>t=n.t.l.*</td>
<td>Text is in bold font.</td>
</tr>
<tr>
<td>.BI t</td>
<td>no</td>
<td>t=n.t.l.</td>
<td>Join words, alternating bold and italic.</td>
</tr>
<tr>
<td>.BR t</td>
<td>no</td>
<td>t=n.t.l.</td>
<td>Join words, alternating bold and roman.</td>
</tr>
<tr>
<td>.DT</td>
<td>no</td>
<td>.5i 1i...</td>
<td>Restore default tabs.</td>
</tr>
<tr>
<td>.HP i</td>
<td>yes</td>
<td>i=p.i.*</td>
<td>Begin paragraph with hanging indent.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set prevailing indent to i.</td>
</tr>
<tr>
<td>.I t</td>
<td>no</td>
<td>t=n.t.l.</td>
<td>Text is italic.</td>
</tr>
<tr>
<td>.IB t</td>
<td>no</td>
<td>t=n.t.l.</td>
<td>Join words, alternating italic and bold.</td>
</tr>
<tr>
<td>.IP x i</td>
<td>yes</td>
<td>x=&quot;&quot;&quot;&quot;&quot;&quot;&quot;</td>
<td>Same as .TP with tag x.</td>
</tr>
<tr>
<td>.IR t</td>
<td>no</td>
<td>t=n.t.l.</td>
<td>Join words, alternating italic and roman.</td>
</tr>
<tr>
<td>.IX t</td>
<td>no</td>
<td>-</td>
<td>Index macro, for Sun internal use.</td>
</tr>
<tr>
<td>.LP</td>
<td>yes</td>
<td>-</td>
<td>Begin left-aligned paragraph.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set prevailing indent to .5i.</td>
</tr>
<tr>
<td>.PD d</td>
<td>no</td>
<td>d=.4v</td>
<td>Set vertical distance between paragraphs.</td>
</tr>
<tr>
<td>.PP</td>
<td>yes</td>
<td>-</td>
<td>Same as .LP.</td>
</tr>
</tbody>
</table>

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Page 1
When formatting a manual page, man examines the first line to determine whether it requires special processing. For example a first line consisting of:

'\" t

indicates that the manual page must be run through the troff(1) preprocessor.

A typical manual page for a command or function is laid out as follows:

.TH title [1-8]
The name of the command or function, which serves as the title of the manual page. This is followed by the number of the section in which it appears.

.SH NAME
The name, or list of names, by which the command is called, followed by a dash and then a one-line summary of the action performed. All in roman font, this section contains no troff(1) commands or escapes, and no macro requests. It is used to generate the whatis(1) database.

.SH SYNOPSIS
Commands:

The syntax of the command and its arguments, as typed on the command line. When in boldface, a word must be typed exactly as printed. When in italics, a word can be replaced with an argument that you supply. References to bold or italicized items are not capitalized in other sections, even when they begin a sentence.
Syntactic symbols appear in roman face:

[ ] An argument, when surrounded by brackets is optional.
| Arguments separated by a vertical bar are exclusive. You can supply only one item from such a list.
... Arguments followed by an ellipsis can be repeated. When an ellipsis follows a bracketed set, the expression within the brackets can be repeated.

Functions:

If required, the data declaration, or `#include` directive, is shown first, followed by the function declaration. Otherwise, the function declaration is shown.

.SH DESCRIPTION
A narrative overview of the command or function's external behavior. This includes how it interacts with files or data, and how it handles the standard input, standard output and standard error. Internals and implementation details are normally omitted. This section attempts to provide a succinct overview in answer to the question, "what does it do?"

Literal text from the synopsis appears in constant width, as do literal filenames and references to items that appear elsewhere in the reference manuals. Arguments are italicized.

If a command interprets either subcommands or an input grammar, its command interface or input grammar is normally described in a USAGE section, which follows the OPTIONS section. The DESCRIPTION section only describes the behavior of the command itself, not that of subcommands.

.SH OPTIONS
The list of options along with a description of how each affects the command's operation.

.SH FILES
A list of files associated with the command or function.

.SH SEE ALSO
A comma-separated list of related manual pages, followed by references to other published materials.

.SH DIAGNOSTICS
A list of diagnostic messages and an explanation of each.

.SH BUGS
A description of limitations, known defects, and possible problems associated with the command or function.

FILES

/usr/uclib/doctools/man
SEE ALSO
    man(1), nroff(1), troff(1), whatis(1)
NAME
me - macros for formatting papers

SYNOPSIS
nroff -me [ options ] filename ...
troff -me [ options ] filename ...

DESCRIPTION
This package of nroff and troff macro definitions provides a canned formatting facility for technical papers in various formats. When producing 2-column output on a terminal, filter the output through col(1).

The macro requests are defined below. Many nroff and troff requests are unsafe in conjunction with this package, however, these requests may be used with impunity after the first .pp:

请求      初始      原因      解释
---------  --------  --------  --------
.(c)       yes       -         开始居中块
.(d)       no        -         开始延迟文本
.(f)       no        -         开始脚注
.(l)       yes       -         开始列表
.(q)       yes       -         开始主要引文
.(x)       no        -         开始索引条目在索引 x
.(z)       no        -         开始浮动保持
.)c         yes       -         结束居中块
.)d         yes       -         结束延迟文本
.)f         yes       -         结束脚注
.)l         yes       -         结束列表
.)q         yes       -         结束主要引文
.)x         yes       -         结束索引条目
.)z         yes       -         结束浮动保持
.++ m H     no        -         定义论文部分。m 定义论文的部，可以是 C（章节），A（附录），P（前言，例如，摘要，目录，表格，等），B（文献），RC（章节重新编号从第一页每章），或 RA（附录重新编号从第一页）。

输出由 eqn, meqn, mefer, 和 tbl(1) preprocessor for equations and tables is acceptable as input.

REQUESTS
In the following list, initialization refers to the first .pp, .lp, .ip, .np, .sh, or .uh macro. This list is incomplete.

REQUESTS
In the following list, initialization refers to the first .pp, .lp, .ip, .np, .sh, or .uh macro. This list is incomplete.

Request Initial Cause Explanation
---------  --------  --------  -------
.(c)       yes       -         Begin centered block
.(d)       no        -         Begin delayed text
.(f)       no        -         Begin footnote
.(l)       yes       -         Begin list
.(q)       yes       -         Begin major quote
.(x)       no        -         Begin indexed item in index x
.(z)       no        -         Begin floating keep
.)c         yes       -         End centered block
.)d         yes       -         End delayed text
.)f         yes       -         End footnote
.)l         yes       -         End list
.)q         yes       -         End major quote
.)x         yes       -         End index item
.)z         yes       -         End floating keep
.++ m H     no        -         Define paper section. m defines the part of the paper, and can be C (chapter), A (appendix), P (preliminary, for instance, abstract, table of contents, etc.), B (bibliography), RC (chapters renumbered from page one each chapter), or RA (appendix renumbered from page one).
<table>
<thead>
<tr>
<th>Command</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.c T</td>
<td>yes</td>
<td>Begin chapter (or appendix, etc., as set by ++). T is the chapter title.</td>
</tr>
<tr>
<td>.1c</td>
<td>1</td>
<td>One column format on a new page.</td>
</tr>
<tr>
<td>.2c</td>
<td>1</td>
<td>Two column format.</td>
</tr>
<tr>
<td>.EN</td>
<td>yes</td>
<td>Space after equation produced by eqn or meqn.</td>
</tr>
<tr>
<td>.EQ x y</td>
<td>yes</td>
<td>Precede equation; break out and add space. Equation number is y. The optional argument x may be I to indent equation (default), L to left-adjust the equation, or C to center the equation.</td>
</tr>
<tr>
<td>.GE</td>
<td>yes</td>
<td>End gremlin picture.</td>
</tr>
<tr>
<td>.GS</td>
<td>yes</td>
<td>Begin gremlin picture.</td>
</tr>
<tr>
<td>.PE</td>
<td>yes</td>
<td>End pic picture.</td>
</tr>
<tr>
<td>.PS</td>
<td>yes</td>
<td>Begin pic picture.</td>
</tr>
<tr>
<td>.TE</td>
<td>yes</td>
<td>End table.</td>
</tr>
<tr>
<td>.TH</td>
<td>yes</td>
<td>End heading section of table.</td>
</tr>
<tr>
<td>.TS x</td>
<td>yes</td>
<td>Begin table; if x is H table has repeated heading.</td>
</tr>
<tr>
<td>.ac A N</td>
<td>no</td>
<td>Set up for ACM style output. A is the Author's name(s), N is the total number of pages. Must be given before the first initialization.</td>
</tr>
<tr>
<td>.b x</td>
<td>no</td>
<td>Print x in boldface; if no argument switch to boldface.</td>
</tr>
<tr>
<td>.ba +n</td>
<td>yes</td>
<td>Augments the base indent by n. This indent is used to set the indent on regular text (like paragraphs).</td>
</tr>
<tr>
<td>.bc</td>
<td>no</td>
<td>Begin new column</td>
</tr>
<tr>
<td>.bi x</td>
<td>no</td>
<td>Print x in bold italics (nofill only)</td>
</tr>
<tr>
<td>.bu</td>
<td>yes</td>
<td>Begin bulleted paragraph</td>
</tr>
<tr>
<td>.bx x</td>
<td>no</td>
<td>Print x in a box (nofill only).</td>
</tr>
<tr>
<td>.ef x</td>
<td>no</td>
<td>Set even footer to x y z</td>
</tr>
<tr>
<td>.eh x</td>
<td>no</td>
<td>Set even header to x y z</td>
</tr>
<tr>
<td>.fo x</td>
<td>no</td>
<td>Set footer to x y z</td>
</tr>
<tr>
<td>.hx</td>
<td>no</td>
<td>Suppress headers and footers on next page.</td>
</tr>
<tr>
<td>.he x</td>
<td>no</td>
<td>Set header to x y z</td>
</tr>
<tr>
<td>.hl</td>
<td>yes</td>
<td>Draw a horizontal line</td>
</tr>
<tr>
<td>.i x</td>
<td>no</td>
<td>Italicize x; if x missing, italic text follows.</td>
</tr>
<tr>
<td>.ip x y</td>
<td>yes</td>
<td>Start indented paragraph, with hanging tag x. Indentation is y ens (default 5).</td>
</tr>
<tr>
<td>.lp</td>
<td>yes</td>
<td>Start left-blocked paragraph.</td>
</tr>
<tr>
<td>.lo</td>
<td>no</td>
<td>Read in a file of local macros of the form .*x. Must be given before initialization.</td>
</tr>
<tr>
<td>.np x</td>
<td>yes</td>
<td>Start numbered paragraph.</td>
</tr>
<tr>
<td>.of x</td>
<td>no</td>
<td>Set odd footer to x y z</td>
</tr>
<tr>
<td>.oh x</td>
<td>no</td>
<td>Set odd header to x y z</td>
</tr>
<tr>
<td>.pd</td>
<td>yes</td>
<td>Print delayed text.</td>
</tr>
<tr>
<td>.pp</td>
<td>yes</td>
<td>Begin paragraph. First line indented.</td>
</tr>
<tr>
<td>.r</td>
<td>yes</td>
<td>Roman text follows.</td>
</tr>
<tr>
<td>.re</td>
<td>no</td>
<td>Reset tabs to default values.</td>
</tr>
<tr>
<td>.sc</td>
<td>no</td>
<td>Read in a file of special characters and diacritical marks. Must be given before initialization.</td>
</tr>
<tr>
<td>.sh n x</td>
<td>yes</td>
<td>Section head follows, font automatically bold. n is level of section, x is title of section.</td>
</tr>
</tbody>
</table>
.sk no no Leave the next page blank. Only one page is remembered ahead.
.sm \[x \rightarrow\] no Set \[x\] in a smaller pointsize.
.sz \[+n\] 10p no Augment the point size by \[n\] points.
.th no no Produce the paper in thesis format. Must be given before initialization.
.tp no yes Begin title page.
.u x - no Underline argument (even in troff). (Nofill only).
.uh - yes Like .sh but unnumbered.
.xp x - no Print index \[x\].

FILES
/usr/ucplib/doctools/tmac/e
/usr/ucplib/doctools/tmac/*.me

SEE ALSO
eqn(1), nroff(1), troff(1), refer(1), tbl(1)
NAME
ms - text formatting macros

SYNOPSIS
nroff -ms [ options ] filename ...
troff -ms [ options ] filename ...

DESCRIPTION
This package of nroff(1) and troff(1) macro definitions provides a formatting facility for various styles of articles, theses, and books. When producing 2-column output on a terminal or lineprinter, or when reverse line motions are needed, filter the output through col(1V). All external -ms macros are defined below.

Note: this -ms macro package is an extended version written at Berkeley and is a superset of the standard -ms macro packages as supplied by Bell Labs. Some of the Bell Labs macros have been removed; for instance, it is assumed that the user has little interest in producing headers stating that the memo was generated at Whippany Labs.

Many nroff and troff requests are unsafe in conjunction with this package. However, the first four requests below may be used with impunity after initialization, and the last two may be used even before initialization:

- begin new page
- break output line
- insert n spacing lines
- center next n lines
- line spacing: n=1 single, n=2 double space
- no alignment of right margin

Font and point size changes with \# and \ are also allowed, for example, \f\text{word}\fR will italicize word. Output of the tbl(1), eqn(1) and refer(1) preprocessors for equations, tables, and references is acceptable as input.

REQUESTS

<table>
<thead>
<tr>
<th>Macro</th>
<th>Initial</th>
<th>Break?</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB x</td>
<td>-</td>
<td>y</td>
<td>begin abstract; if x=no do not label abstract</td>
</tr>
<tr>
<td>AE</td>
<td>-</td>
<td>y</td>
<td>end abstract</td>
</tr>
<tr>
<td>AI</td>
<td>-</td>
<td>y</td>
<td>author's institution</td>
</tr>
<tr>
<td>AM</td>
<td>-</td>
<td>n</td>
<td>better accent mark definitions</td>
</tr>
<tr>
<td>AU</td>
<td>-</td>
<td>y</td>
<td>author's name</td>
</tr>
<tr>
<td>B x</td>
<td>-</td>
<td>n</td>
<td>embolden x; if no x, switch to boldface</td>
</tr>
<tr>
<td>B1</td>
<td>-</td>
<td>y</td>
<td>begin text to be enclosed in a box</td>
</tr>
<tr>
<td>B2</td>
<td>-</td>
<td>y</td>
<td>end boxed text and print it</td>
</tr>
<tr>
<td>BT</td>
<td>date</td>
<td>n</td>
<td>bottom title, printed at foot of page</td>
</tr>
<tr>
<td>BX x</td>
<td>-</td>
<td>n</td>
<td>print word x in a box</td>
</tr>
<tr>
<td>CM</td>
<td>if t</td>
<td>n</td>
<td>cut mark between pages</td>
</tr>
<tr>
<td>CT</td>
<td>-</td>
<td>y,y</td>
<td>chapter title: page number moved to CF (TM only)</td>
</tr>
<tr>
<td>DA x</td>
<td>if n</td>
<td>n</td>
<td>force date x at bottom of page; today if no x</td>
</tr>
<tr>
<td>DE</td>
<td>-</td>
<td>y</td>
<td>end display (unfilled text) of any kind</td>
</tr>
<tr>
<td>DS x y</td>
<td>I</td>
<td>y</td>
<td>begin display with keep; x=I, L, C, B; y=indent</td>
</tr>
</tbody>
</table>
.ID y 8n,5i y indented display with no keep; y=indent
.LD - y left display with no keep
.CD - y centered display with no keep
.BD - y block display; center entire block
.EF x - n even page footer x (3 part as for .tl)
.EH x - n even page header x (3 part as for .tl)
.EN - y end displayed equation produced by eqn
.EQ x y - y break out equation; x=L,I,C; y=equation number
.FE - n end footnote to be placed at bottom of page
.FP - n numbered footnote paragraph; may be redefined
.FS x - n start footnote; x is optional footnote label
.HD undef n optional page header below header margin
.I x - n italicize x; if no x, switch to italics
.IP xy y,y indented paragraph, with hanging tag x; y=indent
.IX x y - y index words x y and so on (up to 5 levels)
.KE - n end keep of any kind
.KF - n begin floating keep; text fills remainder of page
.KS - y begin keep; unit kept together on a single page
.LG - n larger; increase point size by 2
.LP - y,y left (block) paragraph
.MC x - y,y multiple columns; x=column width
.ND x if t n no date in page footer; x is date on cover
.NH x y - y,y numbered header; x=level, x=0 resets, x=S sets to y
.NL 10p n set point size back to normal
.OF x - n odd page footer x (3 part as for .tl)
.OH x - n odd page header x (3 part as for .tl)
.PI if TM n print header on first page
.PP - y,y paragraph with first line indented
.PT - % - n page title, printed at head of page
.PX x - y print index (table of contents); x=no suppresses title
.QP - y,y quote paragraph (indented and shorter)
.R on n return to Roman font
.RE 5n y,y retreat: end level of relative indentation
.RP x - n released paper format; x=no stops title on first page
.RS 5n y,y right shift: start level of relative indentation
.SH - y,y section header, in boldface
.SM - n smaller; decrease point size by 2
.TA 8n,5n n set TAB characters to 8n 16n ... (.nroff) 5n 10n ... (.troff)
.TC x - y print table of contents at end; x=no suppresses title
.TE - y end of table processed by tbl
.TH - y end multi-page header of table
.TL - y title in boldface and two points larger
.TM off n UC Berkeley thesis mode
.TS x - y,y begin table; if x=H table has multi-page header
.UL x - n underline x, even in .troff
.UX x - n UNIX; trademark message first time; x appended
.XA x y - y another index entry; x=page or no for none; y=indent
.XE - y end index entry (or series of .IX entries)
.XP - y,y paragraph with first line indented, others indented
Formatting distances can be controlled in \texttt{ms} by means of built-in number registers. For example, this sets the line length to 6.5 inches:

\texttt{nr LL 6.5i}

Here is a table of number registers and their default values:

<table>
<thead>
<tr>
<th>Name</th>
<th>Register Controls</th>
<th>Takes Effect</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS</td>
<td>point size</td>
<td>paragraph</td>
<td>10</td>
</tr>
<tr>
<td>VS</td>
<td>vertical spacing</td>
<td>paragraph</td>
<td>12</td>
</tr>
<tr>
<td>LL</td>
<td>line length</td>
<td>paragraph</td>
<td>6i</td>
</tr>
<tr>
<td>LT</td>
<td>title length</td>
<td>next page</td>
<td>same as LL</td>
</tr>
<tr>
<td>FL</td>
<td>footnote length</td>
<td>next .FS</td>
<td>5.5i</td>
</tr>
<tr>
<td>PD</td>
<td>paragraph distance</td>
<td>paragraph</td>
<td>1v (if n), .3v (if t)</td>
</tr>
<tr>
<td>DD</td>
<td>display distance</td>
<td>displays</td>
<td>1v (if n), .5v (if t)</td>
</tr>
<tr>
<td>PI</td>
<td>paragraph indent</td>
<td>paragraph</td>
<td>5n</td>
</tr>
<tr>
<td>QI</td>
<td>quote indent</td>
<td>next .QP</td>
<td>5n</td>
</tr>
<tr>
<td>FI</td>
<td>footnote indent</td>
<td>next .FS</td>
<td>2n</td>
</tr>
<tr>
<td>PO</td>
<td>page offset</td>
<td>next page</td>
<td>0 (if n), ~1i (if t)</td>
</tr>
<tr>
<td>HM</td>
<td>header margin</td>
<td>next page</td>
<td>1i</td>
</tr>
<tr>
<td>FM</td>
<td>footer margin</td>
<td>next page</td>
<td>1i</td>
</tr>
<tr>
<td>FF</td>
<td>footnote format</td>
<td>next .FS</td>
<td>0 (1, 2, 3 available)</td>
</tr>
</tbody>
</table>

When resetting these values, make sure to specify the appropriate units. Setting the line length to 7, for example, will result in output with one character per line. Setting FF to 1 suppresses footnote superscripting; setting it to 2 also suppresses indentation of the first line; and setting it to 3 produces an .IP-like footnote paragraph.

Here is a list of string registers available in \texttt{ms}; they may be used anywhere in the text:

Name                  | String's Function
---                   |----------------------
\texttt{\textbackslash{}Q} & quote (" in nroff, \" in troff)
\texttt{\textbackslash{}U} & unquote (" in nroff, \" in troff)
\texttt{\textbackslash{}*} & dash (-- in nroff, -- in troff)
\texttt{\textbackslash{}* (MO)} & month (month of the year)
\texttt{\textbackslash{}* (DY)} & day (current date)
\texttt{\textbackslash{}**} & automatically numbered footnote
\texttt{\textbackslash{}*'} & acute accent (before letter)
\texttt{\textbackslash{}*\textbackslash{}'} & grave accent (before letter)
\texttt{\textbackslash{}*^} & circumflex (before letter)
\texttt{\textbackslash{}*\textbackslash{}^} & cedilla (before letter)
\texttt{\textbackslash{}*:} & umlaut (before letter)
\texttt{\textbackslash{}*\textbackslash{}} & tilde (before letter)
When using the extended accent mark definitions available with .AM, these strings should come after, rather than before, the letter to be accented.

FILES
/usr/ucb/lib/doctools/tmac/s
/usr/ucblib/doctools/tmac/ms.???

SEE ALSO
col(1V), eqn(1), nroff(1), refer(1), tbl(1), troff(1)

BUGS
Floating keeps and regular keeps are diverted to the same space, so they cannot be mixed together with predictable results.
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Overview

This guide describes the new commands and system calls in the XENIX Compatibility Package that allow System V Release 4.0 users to run programs developed in the XENIX environment. This guide is organized into the following sections:

1. A brief description of commands by function.
2. A brief description of system calls by function.
3. A section containing the manual pages of the listed features.

Audience

This compatibility guide is useful for programmers who need specific information about a feature's functionality and system administrators who are involved with file management.

Running XENIX Programs

Various modifications have been made to the UNIX kernel to make System V Release 4.0 compatible with XENIX. Before running any shell scripts or programs, please note the following:

- Read the "Tunable Parameters" section to learn which XENIX parameters are defined in the /etc/master.d/kernel file.

- In the Source Code Provision Build Instructions, read the section on installing the XENIX Compatibility Package and on rebuilding the kernel to give System V the ability to allocate IPC semaphores and shared data.

- Once the compatibility package is installed, you can make use of it by setting your PATH variable so that /usr/ucb comes before the default System V path directories such as /usr/bin and /usr/bin. /usr/ucb contains the compatibility package commands.
Tunable Parameters

Tunable system parameters are used to set various table sizes and system thresholds to handle the expected system load. Caution should be used when changing these variables since such changes can directly affect system performance.

The following table gives the tunable parameters for XENIX compatibility.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>default</th>
<th>min</th>
<th>max</th>
<th>size</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSTFLAG</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>TIMEZONE</td>
<td>0</td>
<td>0</td>
<td>1440</td>
<td>-</td>
</tr>
<tr>
<td>XSEMMAX</td>
<td>60</td>
<td>20</td>
<td>60</td>
<td>12</td>
</tr>
<tr>
<td>XSDSEGS</td>
<td>25</td>
<td>1</td>
<td>25</td>
<td>12</td>
</tr>
<tr>
<td>XSDSLOTS</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>20 x XSDSEGS</td>
</tr>
</tbody>
</table>

Timezone Parameters

The following tunable parameters are defined in /etc/master.d/kernel. They are defined for the ftime(2) system call. Use of the TZ environment variable is encouraged instead.

**Dstflag**
Specifies whether daylight savings time applies locally during the appropriate part of the year. The default is 0.

**Timezone**
Specifies the local time zone measured in minutes of time westward from Greenwich. The default is 0.

XENIX Shared Data Parameters

The following tunable parameters are defined in /etc/master.d/kernel.

**XSDSEGS**
Specifies the number of shared data segments in the system. The minimum value is 1, and the default is 25.

**XSDSLOTS**
(XSDSEGS x XSDSLOTS) specifies the maximum number of shared data segment attachments allowed in the system. The minimum value of XSDSLOTS is 1, and the default is 3.
XENIX Semaphore Tunable Parameters

The following parameters are defined in /etc/master.d/xnamfs.

XSEMMAX Specifies the number of XENIX semaphores in the system. The default value is 60, and the minimum is 1.

Refer to the "Tunable Parameters" section in the "Performance Management" chapter of the System Administrator's Guide for more information.
Commands by Function

UNIX/XENIX Administration

backup
This is a shell script that invokes find and cpio to do back-ups. The backup consists of a header record, some bit mask records, a group of records describing file system directories, a group of records describing file system files, and some records describing a second bit mask.

custom
Installs selected parts of the XENIX system.

restore
Restore file to original directory.

xinstall
This command installs the XENIX system.

File Management

copy
This command copies contents of directories to another directory. Since there may be more than one source directory, it effectively allows you to copy whole file systems.

egrep
Added the \( -y \) option to ignore upper/lower case distinctions.

fgrep
Added the \( -y \) option to ignore upper/lower case distinctions.

fixperm
Corrects or initializes the permissions and ownership on files.

grep
Added the \( -y \) option to ignore upper/lower case distinctions.

hd
Displays the contents of files in hexadecimal, octal, decimal, and character formats.

ls
Lists the contents of files and directories in columns.

settime
Sets the access and modification dates for one or more files.
Terminal Management

**tset**  Allows the user to set a terminal's ERASE and kill characters, and define the terminal's type and capabilities by creating values for the TERM and TERMCAPE environment variables.

Shell Program Utilities

**random**  Generates a random number, which, by default, is 0 or 1.

**yes**  Repeatedly outputs the 'y' character.
System Calls

File Management

- **chsize**: Changes the size of the file to a specified length by either truncating the file or padding it with an appropriate number of bytes.
- **locking**: Allows a specified number of bytes in a file to be controlled by the locking process, to lock or unlock a file region for reading or writing.
- **mknod**: Creates a new file name by the pathname pointed to by path.
- **rdchk**: Checks to see if a process will block if it attempts to read the data in a file.
- **stat**: Obtains information about the named file pointed to by path.

Process Management

- **lock**: Locks a process in primary memory.
- **nap**: Suspends the execution of a current process for a short interval.
- **ftime**: Gets the time and date and returns the time in a structure pointed to by its argument.

Inter-Process Communications

- **creatsem**: Defines a binary semaphore and returns a unique semaphore number used by the waitsem and sigsem system calls to set parameters. creatsem also manages mutually exclusive access to a resource, shared variable or critical section of a program.
- **nbwaitsem**: Will fail if a semaphore is busy instead of waiting [see waitsem(2)].
System Calls

opensem

Opens a named semaphore and returns the unique semaphore semaphore identification number used by waitsem and sigsem.

stat

Puts data returned by stat system call in a special format.

sdenter

Synchronizes access to a shared data segment by indicating that the current process is about to access the contents of the same.

sdfree

Detaches the current process from the shared data segment that is attached at the specified address [see sdget(2)].

sdget

Attaches a shared data segment to the data space of the current process.

sdgetv

Synchronizes cooperating processes that are using shared data segments.

sdleave

Used in conjunction with sdenter to synchronize processes using shared data segments [see sdenter(2)].

sdwaitv

Used in conjunction with sdgetv to synchronize processes using shared data segments [see sdgetv(2)].

sigsem

Signals a process that is waiting on the semaphore that it may proceed and use the resource governed by the semaphore.

waitsem

Awaits and checks access to a resource governed by a semaphore. It is used in conjunction with sigsem.
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Permissions and ownership

Root user can:
- Access and modify all files
- Execute any command

Non-root user can:
- Access and modify files in their home directory
- Execute commands with su privileges

A binary semaphore

- Provides exclusive access to a resource
- Used for synchronization

A semaphore

- Enables multiple processes to access a resource
- Used for synchronization

Backup

- Performs file backup functions
- Creates backups of important data

Settime

- Changes access and modification times of files
- Used for auditing and logging

Fixperm

- Corrects or initializes file permissions
- Ensures file security

Rdchk

- Checks files for data to be read
- Ensures data integrity

Xinstall

- Installs packages and files
- Customizes system configuration

Chsize

- Changes the size of a file
- Updates file metadata

Chsize and chsize(2)

- Changes the size of a file
- Updates file metadata

Fixperm and fixperm(1)

- Corrects or initializes file permissions
- Ensures file security

Permissions and ownership

- Root user can:
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NAME
backup - performs backup functions

SYNOPSIS
backup [-t] [-p] [-c] [-f <files>] [-u "<user1> [user2]>"] -d <device>
backup -h

DESCRIPTION
-h produces a history of backups. Tells the user when the last complete and
incremental/partial backups were done.

-c complete backup. All files changed since the system was installed are
backed up. If an incremental/partial backup was done, all files modified
since that time are backed up, otherwise all files modified since the last
complete backup are backed up. A complete backup must be done before
a partial backup.

-f backup files specified by the <files> argument. File names may contain
characters to be expanded (i.e., *, .) by the shell. The argument must be in
quotes.

-u backup a user's home directory. All files in the user's home directory will
be backed up. At least one user must be specified but it can be more.
The argument must be in quotes if more than one user is specified. If the
user name is "all", then all the user's home directories will be backed up.

-d used to specify the device to be used. It defaults to /dev/SA/diskette.

-t used when the device is a tape. This option must be used with the -d
option when the tape device is specified.

A complete backup must be done before a partial backup can be done. Raw dev-
ices rather than block devices should always be used. The program can handle
multi-volume backups. The program will prompt the user when it is ready for
the next medium. The program will give you an estimated number of
floppies/tapes that will be needed to do the backup. Floppies must be formatted
before the backup is done. Tapes do not need to be formatted. If backup is done
to tape, the tape must be rewound.
copy(1)  copy(1)

NAME

copy - copies groups of files.

SYNOPSIS

copy [option]...source...dest

DESCRIPTION

The copy command copies the contents of directories to another directory. It is possible to copy whole file systems since directories are made when needed.

If files, directories, or special files do not exist at the destination, then they are created with the same modes and flags as the source. In addition, the super-user may set the user and group ID. The owner and mode are not changed if the destination file exists. Note that there may be more than one source directory. If so, the effect is the same as if the copy command had been issued for each source directory with the same destination directory for each copy.

All of the options must be given as separate arguments, and they may appear in any order even after the other arguments. The arguments are:

- a  Asks the user before attempting a copy. If the response does not begin with a "y", then a copy is not done. This option also sets the ad option.

- l  Uses links instead whenever they can be used. Otherwise a copy is done. Note that links are never done for special files or directories.

- n  Requires the destination file to be new. If not, then the copy command does not change the destination file. The -n flag is meaningless for directories. For special files an -n flag is assumed (i.e., the destination of a special file must not exist).

- o  If set then every file copied has its owner and group set to those of source. If not set, then the file's owner is the user who invoked the program.

- m  If set, then every file copied has its modification time and access time set to that of the source. If not set, then the modification time is set to the time of the copy.

- r  If set, then every directory is recursively examined as it is encountered. If not set, then any directories that are found are ignored.

- ad  Asks the user whether an -r flag applies when a directory is discovered. If the answer does not begin with a "y", then the directory is ignored.

- v  If the verbose option is set, messages are printed that reveal what the program is doing.

source  This may be a file, directory or special file. It must exist. If it is not a directory, then the results of the command are the same as for the cp command.
dest The destination must be either a file or directory that is different from the source. If source and destination are anything but directories, then copy acts just like a cp command. If both are directories, then copy copies each file into the destination directory according to the flags that have been set.

NOTES Special device files can be copied. When they are copied, any data associated with the specified device is not copied.
NAME
custom - install specific portions of a UNIX package

SYNOPSIS
custom [-ir] [package] [-m device] [-f [file]]

DESCRIPTION
custom allows the super-user to create a custom installation by selectively install­
ing or deleting portions of the UNIX packages to or from the 386 operating sys­
tem. It can be used interactively or it can be invoked from the command line
with applicable command options.

Files are extracted or deleted in packages. A package is a collection of individual
files that are grouped together in sets.

When in interactive mode, custom prompts you for volume 1 of the new product
distribution and extracts the product information necessary to support it. The
following menu provides support for adding or removing a package:

1. Install one or more packages
2. Remove one or more packages
3. List the files in a package
4. Install a single file
5. Select a new set to customize
6. Display current disk usage
7. Help

When you enter a menu option, you are prompted for further information. The
following describes what actions are necessary for each menu option:

1. Install
   Prompts for one or more package names
   Calculates which installation volumes (distribution media) are needed and
   then prompts the user for the correct volume numbers. If multiple pack­
   ages are specified, the names should be separated by spaces on the com­
   mand line.

   This option, as well as "2" and "3," displays a list of available packages in the
   selected set. Each line describes the package name, whether the package is fully
   installed, not installed or partially installed, the size of the package (in 512 byte
   blocks), and a one line description of the package contents.

2. Remove
   Prompts for one or more package names.
   Deletes the correct files in the specified package. If multiple packages are
   specified, the names should be separated by spaces on the command line.

   Displays available packages (see option "1").

3. List files in a package
   Lists all files in the specified package
   Prompts for one or more package names. Enter the name of the desired
   package(s).

   Displays available packages (see option "1").
4. Install a single file
   Retrieves the specified file from the distribution set
   Filename should be a full pathname relative to the root directory "/".

5. Select a new set
   Allows the user to work from a different set

6. Display current disk usage
   Tells current disk usage.

7. Help
   Prints a page of instructions to help you use custom.
   
   -A set identifier
   
   -i Install the specified package(s)
   
   -r Remove the specified package(s)
   
   -l List the files in the specified package(s)
   
   -f Install the specified file

FILES
   /etc/ perms/*

SEE ALSO
   fixperm(1M), df(1M), du(1M), install(1M)
NAME
egrep - search a file for a pattern using full regular expressions

SYNOPSIS
egrep [options] full regular expression [file ...]

DESCRIPTION
egrep (expression grep) searches files for a pattern of characters and prints all lines
that contain that pattern. egrep uses full regular expressions (expressions that
have string values that use the full set of alphanumerical and special characters) to
match the patterns. It uses a fast deterministic algorithm that sometimes needs
exponential space.

egrep accepts full regular expressions as in ed(1), except for \( and \), with the
addition of:
1. A full regular expression followed by + that matches one or more
   occurrences of the full regular expression.
2. A full regular expression followed by ? that matches 0 or 1 occurrences of
   the full regular expression.
3. Full regular expressions separated by | or by a new-line that match strings
   that are matched by any of the expressions.
4. A full regular expression that may be enclosed in parentheses () for
   grouping.

Be careful using the characters $, *, [], ^, (, ), and \ in full regular expression,
because they are also meaningful to the shell. It is safest to enclose the entire full
regular expression in single quotes ’ ’.

The order of precedence of operators is [ ], then *, +?, then concatenation, then |
and new-line.

If no files are specified, egrep assumes standard input. Normally, each line
found is copied to the standard output. The file name is printed before each line
found if there is more than one input file.

Command line options are:
- b Precede each line by the block number on which it was found. This can be
  useful in locating block numbers by context (first block is 0).
- c Print only a count of the lines that contain the pattern.
- h Suppresses printing of filenames when searching multiple files.
- l, - y Ignore upper/lower case distinction during comparisons.
- l Print the names of files with matching lines once, separated by new-lines.
  Does not repeat the names of files when the pattern is found more than
  once.
- n Precede each line by its line number in the file (first line is 1).
- v Print all lines except those that contain the pattern.
- e special_expression
  Search for a special expression (full regular expression that begins with a -).
- f file
  Take the list of full regular expressions from file.
SEE ALSO
   ed(1), fgrep(1), grep(1), sed(1), sh(1).

DIAGNOSTICS
   Exit status is 0 if any matches are found, 1 if none, 2 for syntax errors or inaccessible files (even if matches were found).

NOTES
   Ideally there should be only one grep command, but there is not a single algorithm that spans a wide enough range of space-time tradeoffs. Lines are limited to BUFSIZ characters; longer lines are truncated. BUFSIZ is defined in /usr/include/stdio.h.
NAME
fgrep — search a file for a character string

SYNOPSIS
fgrep [options] string [file ...]

DESCRIPTION
fgrep (fast grep) searches files for a character string and prints all lines that contain that string. fgrep is different from grep(1) and egrep(1) because it searches for a string, instead of searching for a pattern that matches an expression. It uses a fast and compact algorithm.

The characters $, *, [ , ^, |, ( , ) , and \ are interpreted literally by fgrep, that is, fgrep does not recognize full regular expressions as does egrep. Since these characters have special meaning to the shell, it is safest to enclose the entire string in single quotes ' ... '.

If no files are specified, fgrep assumes standard input. Normally, each line found is copied to the standard output. The file name is printed before each line found if there is more than one input file.

Command line options are:
-b Precede each line by the block number on which it was found. This can be useful in locating block numbers by context (first block is 0).
-c Print only a count of the lines that contain the pattern.
-h Suppresses printing of filenames when searching multiple files.
-1, -y Ignore upper/lower case distinction during comparisons.
-l Print the names of files with matching lines once, separated by new-lines. Does not repeat the names of files when the pattern is found more than once.
-n Precede each line by its line number in the file (first line is 1).
-v Print all lines except those that contain the pattern.
-x Print only lines matched entirely.
-e special_string
Search for a special string (string begins with a -).
-f file
Take the list of strings from file.

SEE ALSO
ed(1), egrep(1), grep(1), sed(1), sh(1).

DIAGNOSTICS
Exit status is 0 if any matches are found, 1 if none, 2 for syntax errors or inaccessible files (even if matches were found).

BUGS
Ideally there should be only one grep command, but there is not a single algorithm that spans a wide enough range of space-time tradeoffs. Lines are limited to BUFSIZ characters; longer lines are truncated. BUFSIZ is defined in /usr/include/stdio.h.
NAME

fixperm - corrects or initializes file permissions and ownership.

SYNOPSIS

fixperm [-cDjlnSsvw[-d package] [-u package]] specfile

DESCRIPTION

For each line in the specification file specfile, fixperm makes the listed pathname conform to a specification. fixperm is typically used to configure a XENIX system upon installation. Nonsuper-users can only use fixperm with the -D, -f, -l, or -n options. Only super-users can use the -c, -d, -l, -n, -S, -u, -v, and -w options.

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</tr>
<tr>
<td>-d</td>
<td>Processes input lines beginning with given package specifier string (see above). For instance, -dBASE processes only items specified as belonging to the Basic utilities set. The default action is to process all lines.</td>
</tr>
<tr>
<td>-f</td>
<td>Lists files only on standard output. Does not modify target files.</td>
</tr>
<tr>
<td>-i</td>
<td>Checks only if the selected packages are installed. Return values are:</td>
</tr>
<tr>
<td></td>
<td>0: package completely installed</td>
</tr>
<tr>
<td></td>
<td>4: package not installed</td>
</tr>
<tr>
<td></td>
<td>5: package partially installed</td>
</tr>
<tr>
<td>-l</td>
<td>Lists files and directories on standard output. Does not modify target files.</td>
</tr>
<tr>
<td>-n</td>
<td>Reports errors only. Does not modify target files.</td>
</tr>
<tr>
<td>-s</td>
<td>Issues a complaint if files are not in x.out format.</td>
</tr>
<tr>
<td>-u</td>
<td>Modifies special device files in addition to the rest of the perm-list.</td>
</tr>
<tr>
<td>-v</td>
<td>Causes similar action to -d option, but processes items that are not part of the given package.</td>
</tr>
<tr>
<td>-v</td>
<td>Issues a complaint if executable files are:</td>
</tr>
<tr>
<td></td>
<td>1) word-swapped</td>
</tr>
<tr>
<td></td>
<td>2) not fixed-stack</td>
</tr>
<tr>
<td></td>
<td>3) not separate I and D</td>
</tr>
<tr>
<td></td>
<td>4) not stripped</td>
</tr>
<tr>
<td>-w</td>
<td>Lists location (volume number ) of the specified files or directories.</td>
</tr>
</tbody>
</table>
Specification File Format

Each nonblank line in the specification file consists of either a comment or an item specification. A comment is any text from a pound sign "#" up to the end of the line. There is one item specification per line. User and group id numbers must be specified at the top of the specification file for each user and group mentioned in the file.

An item specification consists of a package specifier, a permission specification, owner and group specifications, the number of links on the file, the filename, and an optional volume number.

The package specifier is an arbitrary string that is the name of a package within a distribution set. A package is a set of files.

A permission specification follows the package specifier. The permission specification consists of a file type, followed by a numeric permission specification. The item specification is one of the following characters:

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>executable</td>
</tr>
<tr>
<td>a</td>
<td>archive</td>
</tr>
<tr>
<td>e</td>
<td>empty file (create if -c option given)</td>
</tr>
<tr>
<td>b</td>
<td>block device</td>
</tr>
<tr>
<td>c</td>
<td>character device</td>
</tr>
<tr>
<td>d</td>
<td>directory</td>
</tr>
<tr>
<td>f</td>
<td>text file</td>
</tr>
<tr>
<td>p</td>
<td>named pipe</td>
</tr>
</tbody>
</table>

If the item specification is given as an uppercase letter, the file associated with it is optional, and fixperm will not return an error message if it does not exist.

The numeric permission conforms to the scheme described in chmod. The owner and group permissions are in the third column separated by slash, such as "bin/bin". The fourth column indicates the number of links. If there are links to the file, the next line contains the linked filename with no other information. The fifth column is a pathname. The pathname must be relative (not preceded by a slash "/"). The sixth column is only used for special files, major and minor device numbers, or volume numbers.

Examples

The following two lines make a distribution and invoke tar to archive only the files in base.perms on /dev/sample:

```
/etc/fixperm -f/etc/base.perms>list
tar cF/dev/sample list
```

This command line reports BASE package errors:

```
/etc/fixperm-nd BASE
```

NOTES

fixperm is usually only run by a shell script at installation.
NAME
grep - search a file for a pattern

SYNOPSIS
grep [options] limited regular expression [file ...]

DESCRIPTION
grep searches files for a pattern and prints all lines that contain that pattern.
grep uses limited regular expressions (expressions that have string values that
use a subset of the possible alphanumeric and special characters) like those used
with ed(1) to match the patterns. It uses a compact non-deterministic algorithm.

Be careful using the characters $, *, [, ^, ], (, ), and \ in the limited regular expres­s­
sion because they are also meaningful to the shell. It is safest to enclose the entire
limited regular expression in single quotes ' ... '.

If no files are specified, grep assumes standard input. Normally, each line found
is copied to standard output. The file name is printed before each line found if
there is more than one input file.

Command line options are:
- -b Precede each line by the block number on which it was found. This can be
  useful in locating block numbers by context (first block is 0).
- -c Print only a count of the lines that contain the pattern.
- -i, -y
  Ignore upper/lower case distinction during comparisons.
- -h Suppresses printing of filenames when searching multiple files.
- -l Print the names of files with matching lines once, separated by new­lines.
  Does not repeat the names of files when the pattern is found more than
  once.
- -n Precede each line by its line number in the file (first line is 1).
- -s Suppress error messages about nonexistent or unreadable files
- -v Print all lines except those that contain the pattern.

SEE ALSO
ed(1), egrep(1), fgrep(1), sed(1), sh(1).

DIAGNOSTICS
Exit status is 0 if any matches are found, 1 if none, 2 for syntax errors or inacces­sible files (even if matches were found).

BUGS
Lines are limited to BUFSIZ characters; longer lines are truncated. BUFSIZ is
defined in /usr/include/stdio.h.
If there is a line with embedded nulls, grep will only match up to the first null; if
it matches, it will print the entire line.
NAME
hd - displays files in hexadecimal format.

SYNOPSIS
hd [ -format [-s offset] [-n count] [file]]

DESCRIPTION
The hd command displays the contents of files in hexadecimal, octal, decimal and
code formats. Control over the specification of ranges of characters is also
available. The default behavior is with the following flags set: "-abx -'A'. This
says that addresses (file offsets) and bytes are printed in hexadecimal and that
characters are also printed. If no file argument is given, the standard input is
read.

Options include: Specify the beginning offset in the file where printing is to
begin. If no file argument is given, or if a seek fails because the input is a pipe,
'offset' bytes are read from the input and discarded. Otherwise, a seek error will
terminate processing of the current file.

The offset may be given in decimal, hexadecimal (preceded by '0x'), or octal (pre­
ceded by a '0'). It is optionally followed by one of the following multipliers: w, l, b, or k; for words (2 bytes), long words (4 bytes), blocks (512 bytes), or K
bytes (1024 bytes). Note that this is the one case where 'b' does not stand for
bytes. Since specifying a hexadecimal offset in blocks would result in an ambigu­
ous trailing 'b', any offset and multiplier may be separated by an asterisk (*).
Specify the number of bytes to process. The count is in the same format as offset,
above.

Format Flags
Format flags may specify addresses, characters, bytes, words (2 bytes), or longs (4
bytes) to be printed in hexadecimal, decimal, or octal. Two special formats may
also be indicated: test or ASCII. Format and base specifiers may be freely com­
bined and repeated as desired in order to specify different bases (hexadecimal,
decimal or octal) for different output formats (addresses, characters, etc.). All for­
mate flags appearing in a single argument are applied as appropriate to all other
flags in that argument.

Output format specifiers for address, characters, bytes, words, longs and ASCII,
respectively. Only one base specifier will be used for addresses; the address will
appear on the first line of output that begins each new offset in the input.

The character format prints printable characters unchanged, special C escapes as
defined in the language, and remaining values in the specified base.

The ASCII format prints all printable characters unchanged, and all others as a
period (.). This format appears to the right of the first of other specified output
formats. A base specifier has no meaning with the ASCII format. If no other out­
put format (other than addresses) is given, bx is assumed. If no base specifier is
given, all of xdo are used. Output base specifiers for hexadecimal, decimal and
octal. If no format specifier is given, all of abcwi are used. Print a test file, each
line preceded by the address in the file. Normally, lines should be terminated by
a \n character; but long lines will be broken up. Control characters in the range
0x00 to 0x1f are printed as '\@' to '\n'. Bytes with the high bit set are preceded
by a tilde ('~') and printed as if the high bit were not set. The special characters
(\",\") are preceded by a backslash (\) to escape their special meaning. As special cases, two values are represented numerically as \177 and \377. This flag will override all output format specifiers except addresses.
NAME
  ls, lc – list contents of directory

SYNOPSIS
  ls [-RldCxmlnogrtucpFbqisfl] [names]
  lc [-lCFLRabcfgilmnopqrstux] [name...]

DESCRIPTION
For each directory argument, ls lists the contents of the directory for each file argument. lc functions the same as ls except that the lc default output format is columnar, even if the output is redirected. ls repeats its name and any other information requested. The output is sorted alphabetically by default. When no argument is given, the current directory is listed. When several arguments are given, the arguments are first sorted appropriately, but file arguments appear before directories and their contents.

There are three major listing formats. The default format for output directed to a terminal is multi-column with entries sorted down the columns. The -1 option allows single column output and -m enables stream output format. In order to determine output formats for the -C, -x, and -m options, ls uses an environment variable, COLUMNS, to determine the number of character positions available on one output line. If this variable is not set, the terminfo(4) database is used to determine the number of columns, based on the environment variable TERM. If this information cannot be obtained, 80 columns are assumed.

The ls command has the following options:
- R  Recursively list subdirectories encountered.
- a  List all entries, including those that begin with a dot (.), which are normally not listed.
- d  If an argument is a directory, list only its name (not its contents); often used with -1 to get the status of a directory.
- L  If an argument is a symbolic link, list the file or directory the link references rather than the link itself.
- C  Multi-column output with entries sorted down the columns. This is the default output format.
- x  Multi-column output with entries sorted across rather than down the page.
- m  Stream output format; files are listed across the page, separated by commas.
- l  List in long format, giving mode, number of links, owner, group, size in bytes, and time of last modification for each file (see below). If the file is a special file, the size field instead contains the major and minor device numbers rather than a size. If the file is a symbolic link, the filename is printed followed by “->” and the pathname of the referenced file.
- n  The same as -l, except that the owner’s UID and group’s GID numbers are printed, rather than the associated character strings.
-o The same as -1, except that the group is not printed.
-\( g \) The same as -1, except that the owner is not printed.
-\( r \) Reverse the order of sort to get reverse alphabetic or oldest first as appropriate.
-\( t \) Sort by time stamp (latest first) instead of by name. The default is the last modification time. (See -n and -c.)
-\( u \) Use time of last access instead of last modification for sorting (with the -\( t \) option) or printing (with the -1 option).
-\( c \) Use time of last modification of the i-node (file created, mode changed, etc.) for sorting (-\( t \)) or printing (-1).
-\( p \) Put a slash (/) after each filename if the file is a directory.
-\( F \) Put a slash (/) after each filename if the file is a directory, an asterisk (*) if the file is an executable, and an ampersand (@) if the file is a symbolic link.
-\( b \) Force printing of non-printable characters to be in the octal \( \backslash d d d \) notation.
-\( q \) Force printing of non-printable characters in file names as the character question mark (?).
-\( i \) For each file, print the i-number in the first column of the report.
-\( s \) Give size in blocks, including indirect blocks, for each entry.
-\( f \) Force each argument to be interpreted as a directory and list the name found in each slot. This option turns off -1, -\( t \), -\( s \), and -\( r \), and turns on -\( a \); the order is the order in which entries appear in the directory.
-\( -1 \) Print one entry per line of output.

The mode printed under the -1 option consists of ten characters. The first character may be one of the following:

\begin{itemize}
  \item \texttt{d} the entry is a directory;
  \item \texttt{l} the entry is a symbolic link;
  \item \texttt{b} the entry is a block special file;
  \item \texttt{c} the entry is a character special file;
  \item \texttt{p} the entry is a fifo (a.k.a. "named pipe") special file;
  \item the entry is an ordinary file.
  \item \texttt{s} the entry is a XENIX semaphore.
  \item \texttt{m} the entry is a XENIX shared data (memory).
\end{itemize}

The next 9 characters are interpreted as three sets of three bits each. The first set refers to the owner's permissions; the next to permissions of others in the user-group of the file; and the last to all others. Within each set, the three characters indicate permission to read, to write, and to execute the file as a program, respectively. For a directory, "execute" permission is interpreted to mean permission to search the directory for a specified file.
ls -l (the long list) prints its output as follows:

```
-rwxrwxrwx 1 smith dev 10876 May 16 9:42 part2
```

Reading from right to left, you see that the current directory holds one file, named `part2`. Next, the last time that file's contents were modified was 9:42 A.M. on May 16. The file contains 10,876 characters, or bytes. The owner of the file, or the user, belongs to the group `dev` (perhaps indicating "development"), and his or her login name is `smith`. The number, in this case 1, indicates the number of links to file `part2`; see `cp(1)`. Finally, the dash and letters tell you that user, group, and others have permissions to read, write, and execute `part2`.

The execute (x) symbol here occupies the third position of the three-character sequence. A - in the third position would have indicated a denial of execution permissions.

The permissions are indicated as follows:

- **r** the file is readable
- **w** the file is writable
- **x** the file is executable
- **-** the indicated permission is not granted
- **l** mandatory locking occurs during access (the set-group-ID bit is on and the group execution bit is off)
- **s** the set-user-ID or set-group-ID bit is on, and the corresponding user or group execution bit is also on
- **S** undefined bit-state (the set-user-ID bit is on and the user execution bit is off)
- **t** the 1000 (octal) bit, or sticky bit, is on [see `chmod(1)`], and execution is on
- **T** the 1000 bit is turned on, and execution is off (undefined bit-state)

For user and group permissions, the third position is sometimes occupied by a character other than x or -. **s** also may occupy this position, referring to the state of the set-ID bit, whether it be the user's or the group's. The ability to assume the same ID as the user during execution is, for example, used during login when you begin as root but need to assume the identity of the user you login as.

In the case of the sequence of group permissions, **l** may occupy the third position. **l** refers to mandatory file and record locking. This permission describes a file's ability to allow other files to lock its reading or writing permissions during access.

For others permissions, the third position may be occupied by **t** or **T**. These refer to the state of the sticky bit and execution permissions.

**EXAMPLES**

An example of a file's permissions is:

```
-rwxr--r--
```

This describes a file that is readable, writable, and executable by the user and readable by the group and others.
Another example of a file's permissions is:

```
-rwsr-xr-x
```

This describes a file that is readable, writable, and executable by the user, readable and executable by the group and others, and allows its user-ID to be assumed, during execution, by the user presently executing it.

Another example of a file's permissions is:

```
-rw-rw-1---
```

This describes a file that is readable and writable only by the user and the group and can be locked during access.

An example of a command line:

```
ls -a
```

This command prints the names of all files in the current directory, including those that begin with a dot (.), which normally do not print.

Another example of a command line:

```
ls -aism
```

This command provides information on all files, including those that begin with a dot (a), the i-number—the memory address of the i-node associated with the file—printed in the left-hand column (i); the size (in blocks) of the files, printed in the column to the right of the i-numbers (s); finally, the report is displayed in the numeric version of the long list, printing the UID (instead of user name) and GID (instead of group name) numbers associated with the files.

When the sizes of the files in a directory are listed, a total count of blocks, including indirect blocks, is printed.

**FILES**

```
/etc/passwd
/etc/group
/usr/share/lib/terminfo/?/*
```

user IDs for `ls -l` and `ls -o`

group IDs for `ls -l` and `ls -g`

terminal information database

**SEE ALSO**

`chmod(1)`, `find(1)`.

**NOTES**

In a Remote File Sharing environment, you may not have the permissions that the output of the `ls -l` command leads you to believe. For more information see the *System Administrator's Guide*.

Unprintable characters in file names may confuse the columnar output options.
NAME
random - generates a random number.

SYNOPSIS
random [-s][scale]

DESCRIPTION
random generates a random number, scale, on the standard output, and returns
the number as its exit value. By default, this number is either 0 or 1. If scale is
given a value between 1 and 255, then the range of the random value is from 0 to
scale. If scale is greater than 255, an error message is printed.

When the -s (silent) option is given, then the random number is returned as an
exit value, but is not printed on the standard output. If an error occurs, random
returns an exit value of zero.

SEE ALSO
rand(3C).

NOTES
This command does not perform any floating point computations. random uses
the time of day as a seed.
NAME

restore – restore file to original directory

SYNOPSIS

restore [-c] [-i] [-o] [-t] [-d <device>] [pattern [pattern]...]

DESCRIPTION

-c complete restore. All files on the tape are restored.

-i gets the index file off of the medium. This only works when the archive
was created using backup. The output is a list of all the files on the
medium. No files are actually restored.

-o overwrite existing files. If the file being restored already exists it will not
be restored unless this option is specified.

-t indicates that the tape device is to be used. Must be used with the -d
option when restoring from tape.

-d <device> is the raw device to be used. It defaults to dev/SA/diskette

When doing a restore, one or more patterns can be specified. These patterns are
matched against the files on the tape. When a match is found, the file is restored.
Since backups are done using full pathnames, the file is restored to its original
directory. Metacharacters can be used to match multiple files. The patterns
should be in quotes to prevent the characters from being expanded before they
are passed to the command. If no patterns are specified, it defaults to restoring
all files. If a pattern does not match any file on the tape, a message is printed.

When end of medium is reached, the user is prompted for the next media. The
user can exit at this point by typing q. (This may cause files to be corrupted if a
file happens to span a medium.) In general, quitting in the middle is not a good
idea.

If the file already exists and an attempt is made to restore it without the -o
option, the file name will be printed on the screen followed by a question mark.
This file will not be restored.

In order for multi-volume restores to work correctly, the raw device must be
used.

SEE ALSO

sh(1).
settime(1)

NAME
settime - changes the access and modification dates of files.

SYNOPSIS
settime mmddhhmm[yy] [-f fname] name...

DESCRIPTION
Sets the access and modification dates for one or more files. The dates are set to
the specified date, or to the access and modification dates of the file specified via
-f. Exactly one of these methods must be used to specify the new date(s). The
first mm is the month number; dd is the day number in the month; hh is the hour
number (24 hour system); the second mm is the minute number; yy is the last two
digits of the year and is optional. For example:

```
settime 1008004583 ralph pete
```

sets the access and modification dates of files ralph and pete to Oct. 8, 12:45 AM,
1983. Another example:

```
settime -f ralph john
```

This sets the access and modification dates of the file, john, to those of the file,
ralph.

NOTES
Use of touch in place of settime is encouraged.
NAME
tset - provides information for setting terminal modes.

SYNOPSIS
tset [options][type]

DESCRIPTION

tset allows the user to set a terminal's ERASE and KILL characters, and define
the terminal's type and capabilities by creating values for the TERM and TERMCAP
environment variables. If a type is given with the -s option, tset creates informa-
tion for a terminal of the specified type. The type may be any type given in
/usr/share/lib/termcap. If the type is not specified with the -s option, tset
creates information for a terminal of the type defined by the value of the environ-
ment variable, TERM unless the -h or -m option is given. If the TERM variable is
undefined, tset looks in /usr/share/lib/termcap for the appropriate informa-
tion. If these options are used, tset searches the /etc/ttytype file for the ter-
mal type corresponding to the current serial port; it then creates information for
a terminal based on this type. If the serial port is not found in /etc/ttytype,
the terminal type is set to dumb.

tset displays the created information at the standard output. The information is
in a form that can be used to set the current environment variables. The exact
form depends on the login shell from which tset was invoked. The examples
below illustrate how to use this information to change the variables.

There are the following options

-e[cP]
Sets the erase character to [c] on all terminals. The default setting is the
BACKSPACE, or CTRL-H.

-E[c] Identical to the -e command except that it only operates on terminals that
can BACKSPACE

-k[c] Sets the KILL character to c, defaulting to CTRL-U.

- Prints the terminal type on the standard output.

- Outputs the "setenv" commands [for csh()], or "export" and assignment
commands [for sh()]. The type of commands are determined by the user's
login shell.

-S Only outputs the strings to be placed in the environment variables.

-R Prints the terminal type on the diagnostic output.

-Q Suppresses the printing of the "Erase set to" and "Kill set to" mes-
gages.

-I Suppresses printing of the terminal initialization strings.

tset is most useful when included in the .login [for
csh()] or .profile [for sh()] file executed automatically at login, with -m
option is given, the first correct mapping prevails.
Examples

tset gt42
  tset -mdialup>300:adm3a-mdialup:dw2-Qr-e$
  tset -mdial:ti733-mplug:?hp2621-munknown:?-e-k^U

To use the information created by the -s option for the Bourne shell, (sh), repeat these commands:

tset -s...>/tmp/tset$
  /tmp/tset$
  rm/tmp/tset$

To use the information create for csh, use:

set noglob

FILES
"/usr/share/lib/termcap"  Terminal capability database.

SEE ALSO
  stty(1), termcap(1), tty(1).
NAME
xinstall - installs commands

SYNOPSIS
xinstall [-c dira] [-f dirb] [-n dire] [-o] [-a] [file [dirz ...]]

DESCRIPTION
xinstall is a command most commonly used in "makefiles" [see make(1)] to
xinstall a file (updated target file) in a specific place within a file system. Each
file is installed by copying it into the appropriate directory, thereby retaining the
mode and owner of the original command file. The program prints messages tel­
ing you exactly what files it is replacing or creating and where they are going.

If no options or directories (dirz ...) are given, xinstall will search [using
find(1)] a set of default directories (/usr/bin/usr/bin, /etc, /usr/lib,
and /usr/usr/lib, in that order) for a file with the same name asfile. When the
first occurrence is found, xinstall issues a message saying that it is overwriting
that file with file, and proceeds to do so. If the file is not found, the program
states this and exits without further action.

If one or more directories (dirz ...) are specified after file, those directories will be
searched before the directories specified in the default list.

The meanings of the options are:

- -c dira Installs a new command file in the directory specified in dira. Looks
for file in dira and xinstalls it there if it is not found. If it is found,
xinstall issues a message saying that the file already exists, and exits
without overwriting it. May be used alone or with the -s option.

- -f dirb Forces file to be installed in given directory, whether or not one
already exists. If the file being installed does not already exist, the
mode and owner of the new file will be set to 755 and bin, respec­
tively. If the file exists, the mode and owner will be that of the
existing file. May be used alone or with the -o or -s options.

- -l Ignores default directory list, searching only through the given
directories (dirz ...). May be used alone or with any other options
except -c and -f.

- -n dire If file is not found in any of the searched directories, it is put in the
directory specified in dire. The mode and owner of the new file will
be set to 755 and bin, respectively. May be used alone or with any
other options except -c and -f.

- -o If file is found, this option saves the "found" file by copying it to
oldfile in the directory in which is was found. May be used alone or
with any other options except -c.

- -s Suppresses printing of messages other than error messages. May be
used alone or with any other options.

SEE ALSO
find(1), make(1)
NAME
  yes - Prints string repeatedly

SYNOPSIS
  yes[string]

DESCRIPTION
  yes repeatedly outputs "y", or if a single string argument is given, arg is output
  repeatedly. The command will continue indefinitely unless aborted. yes is use-
  ful in pipes to commands that prompt for input and require a "y" response for a
  yes. In this case, yes terminates when the command that it pipes to terminates
  so that no infinite loop occurs.
This section describes all the system calls. Many of these calls have one or more error returns. An error condition is indicated by an otherwise impossible returned value which is almost always -1 or the NULL pointer. The individual descriptions specify the details. The following is a complete list of the error names and their descriptions.

**EACCESS**
Search permission is denied for a component of the path prefix.

**EDEADLK**
A process' attempt to lock a file region would cause a deadlock between processes vying for control of that region.

**EEXIST**
The named file exists.

**EFAULT**
`buf` or `path` points to an invalid address.

**EFAULT**
`path` points outside the allocated address space of the process.

**EINVAL**
An invalid argument was specified mentioning an undefined signal in a call to the `signal` or `kill` routine. Also set by the functions described in the math package (3M).

**EINTR**
A signal was caught during the system call.

**EISNAM**
A XENIX name file (semaphore, shared data, etc.) was specified when not expected.

**ELOOP**
Too many symbolic links were encountered in translating `path`.

**EMULTIHOP**
Components of `path` require hopping to multiple remote machines.

**ENAMETOOLONG**
The length of the `path` argument exceeds `{PATH_MAX}`, or the length of a `path` component exceeds `{NAME_MAX}` while `_POSIX_NO_TRUNC` is in effect.

**ENAVAIL**
An `opensem(2)`, `waitsem(2)` or `sigsem(2)` was issued to a XENIX semaphore that has not been initialized by a call to `creatsem(2)`. A `sigsem` was issued to a XENIX semaphore out of sequence; i.e., before the process has issued the corresponding `waitsem` to the semaphore. An `nbwaitsem` was issued to a semaphore guarding a resource that is currently in use by another process. The semaphore that a process was waiting on has been left in an inconsistent state when the process controlling the semaphore exited without relinquishing control properly; i.e., without issuing a `waitsem` on the semaphore.
<table>
<thead>
<tr>
<th>Error Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENOENT</td>
<td>The named file does not exist or is the null pathname.</td>
</tr>
<tr>
<td>ENOENT</td>
<td>A component of the path prefix does not exist or is a null pathname.</td>
</tr>
<tr>
<td>ENOLCK</td>
<td>Cannot allocate a record lock for fcntl or locking.</td>
</tr>
<tr>
<td>ENOLINK</td>
<td><em>path</em> points to a remote machine and the link to that machine is no longer active.</td>
</tr>
<tr>
<td>ENOSPC</td>
<td>No space is available.</td>
</tr>
<tr>
<td>ENOTDIR</td>
<td>A component of the path prefix is not a directory.</td>
</tr>
<tr>
<td>ENOTNAM</td>
<td>Not available. <em>A creatsem, opensem(2), waitsem(2), or sigsem(2) was issued using and invalid XENIX semaphore identifier. Or, a process attempted a sdget(2) on a file that exists but is not shared data type.</em></td>
</tr>
<tr>
<td>EOVERFLOW</td>
<td>A component is too large to store in the structure pointed to by <em>buf</em>. does not exist or is a null pathname.</td>
</tr>
<tr>
<td>EPERM</td>
<td>The effective user ID of the process is not super-user.</td>
</tr>
<tr>
<td>EROFS</td>
<td>The directory in which the file is to be created is located on a read-only file system.</td>
</tr>
</tbody>
</table>
NAME

csize - changes the size of a file

SYNOPSIS

cc [flag ...] file ... -lx
int csize (int fildes, long size);

DESCRIPTION

fildes is a file descriptor obtained from a create, open, dup, fcntl, or pipe
system call. csize changes the size of the file associated with the file descriptor
fildes to be exactly size bytes in length. The routine either truncates the file, or
pads it with an appropriate number of bytes. If size is less than the initial size of
the file, then all allocated disk blocks between size and the initial file size are
freed.

The maximum file size as set by ulimit(2) is enforced when csize is called,
rather than on subsequent writes. Thus csize fails, and the file size remains
unchanged if the new changed file size would exceed the ulimit.

DIAGNOSTICS

Upon successful completion, a value of 0 is returned. Otherwise, the value -1 is
returned and errno is set to indicate the error.

SEE ALSO

creat(2), dup(2), lseek(2), open(2), pipe(2), ulimit(2)

NOTES

In general if csize is used to expand the size of a file, when data is written to
the end of the file, intervening blocks are filled with zeros. In a some cases,
reducing the file size may not remove the data beyond the new end-of-file.
NAME
creatsem – creates an instance of a binary semaphore.

SYNOPSIS
cc [flag ...] file ... -lx
int creatsem(int sem_num, int mode, char *sem_name);

Description
creatsem defines a binary semaphore named by sem_name to be used by waitsem and sigsem to manage mutually exclusive access to a resource, shared variable, or critical section of a program. creatsem returns a unique semaphore number, sem_num, which may then be used as the parameter in waitsem and sigsem calls. Semaphores are special files of 0 length. The filename space is used to provide unique identifiers for semaphores. mode sets the accessibility of the semaphore using the same format as file access bits. Access to a semaphore is granted only on the basis of the read access bit; the write and execute bits are ignored.

A semaphore can be operated on only by a synchronizing primitive, such as waitsem or sigsem, by creatsem which initializes it to some value, or by opensem which opens the semaphore for use by a process. Synchronizing primitives are guaranteed to be executed without interruption once started. These primitives are used by associating a semaphore with each resource (including critical code sections) to be protected.

The process controlling the semaphore should issue:
sem_num = creatsem("semaphore", mode);
to create, initialize, and open the semaphore for that process. All other processes using the semaphore should issue:
sem_num = opensem("semaphore");
to access the semaphore's identification value. Note that a process cannot open and use a semaphore that has not been initialized by a call to creatsem, nor should a process open a semaphore more than once in one period of execution. Both the creating and opening processes use waitsem and sigsem to use the semaphore sem_num.

DIAGNOSTICS
creatsem returns the value -1 if an error occurs. If the semaphore named by sem_name is already open for use by other processes, errno is set to EEXIST. If the file specified exists but is not a semaphore type, errno is set to ENOTNAM. If the semaphore has not been initialized by a call to creatsem, errno is set to EINVAL.

SEE ALSO
opensem(2), sigsem(2), waitsem(2).

NOTES
After a creatsem, you must do a waitsem to gain control of a given resource.
NAME
ftime - gets time and date

SYNOPSIS
cc [flag ...] file ... -lx [library ...]
#include <sys/times.h>
ftime(struct timeb *tp);

DESCRIPTION
ftime returns the time in a structure (see DIAGNOSTICS below). ftime will fail if
tp points to an illegal address [EFAULT].

DIAGNOSTICS
The ftime entry fills in a structure pointed to by its argument, as defined by
<sys/timeb.h>:
    /* Structure returned by ftime system call */
    struct timeb {
        long time;
        unsigned short millitm;
        short timezone;
        short dstflag;
    };

Note that the timezone value is a system default timezone and not the value of
the TZ environment variable.

The structure contains the time since the 00:00:00 GMT, January 1, 1970 up to 1000
milliseconds of more-precise interval, the local time zone (measured in minutes of
time westward from Greenwich), and a flag that, if nonzero, indicates that Day­
light Saving time applies locally during the appropriate part of the year.

SEE ALSO
stime(2), ctime(3C),

NOTES
Since ftime does not return the correct timezone value, its use is not recom­
manded. See ctime(3C) for accurate use of the TZ variable.
NAME
   lock - locks a process in primary memory.

SYNOPSIS
   int lock(flag)
   cc [flag ...] file ... -lx

DESCRIPTION
   If the flag argument is nonzero, the process executing this call will not be swapped unless it is required to grow. If the argument is zero, the process is unlocked. This call may only be executed by the super-user. If someone other than the super-user tries to execute this call, a value of -1 is returned and the errno is set to EPERM.
locking(2)

NAME
locking - locks or unlocks a file region for reading or writing

SYNOPSIS
cc [flag ...] file ... -lx
locking (int fildes, int mode, long size)

DESCRIPTION
locking allows a specified number of bytes in a file to be controlled by the locking process. Other processes which attempt to read or write a portion of the file containing the locked region may sleep until the area become unlocked depending upon the mode in which the file region was locked.

A process that attempts to write to or read a file region that has been locked against reading and writing by another process (using the LK_LOCK or LK_NBLCK mode) will sleep until the region of the file has been released by the locking process, but a read request for that file region will proceed normally.

A process that attempts to lock a region of a file that contains areas that have been locked by other processes will sleep if it has specified the LK_LOCK or LK_NBLCK mode in its lock request, but will return with the error EACCES if it specified LK_NBLCK or LK_NBRLCK.

fildes is the value returned from a successful create, open, dup, or pipe system call.

mode specifies the type of lock operation to be performed on the file region. The available values for mode are:

LK_UNLCK 0 Unlocks the specified region. The calling process releases a region of the file it has previously locked.

LK_LOCK 1 Locks the specified region. The calling process will sleep until the entire region is available if any part of it has been locked by a different process. The region is then locked for the calling process and no other process may read or write in any part of the locked region (lock against read and write).

LK_NBLCK 2 Locks the specified region. If any part of the region is already locked by a different process, return the error EACCES instead of waiting for the region to become available for locking (nonblocking lock request).

LK_RLCK 3 Same as LK_LOCK except that the locked region may be read by other processes (read permitted lock).

LK_NBRLCK 4 Same as LK_NBLCK except that the locked region may be read by other processes (nonblocking, read permitted lock).
The locking utility uses the current file pointer position as the starting point for the locking of the file segment. So a typical sequence of commands to lock a specific range within a file might be as follows:

```c
fd=open("datafile",O_RDWR);
lseek(fd, 200L, 0);
locking(fd, LK_LOCK, 200L);
```

Accordingly, to lock or unlock an entire file a `seek` to the beginning of the file (position 0) must be done and then a `locking` call must be executed with a size of 0.

`size` is the number of contiguous bytes to be locked for unlocked. The region to be locked starts at the current offset in the file. If `size` is 0, the entire file is locked or unlocked. `size` may extend beyond the end of the file, in which case only the process issuing the lock call may access or add information to the file within the boundary defined by `size`.

The potential for a deadlock occurs when a process controlling a locked area is put to sleep by accessing another process' locked area. Thus calls to `locking`, `read`, or `write` scan for a deadlock prior to sleeping on a locked region. An `EDEADLK` error return is made if sleeping on the locked region would cause a deadlock.

Lock requests may, in whole or part, contain or be contained by a previously locked region for the same process. When this occurs, or when adjacent regions are locked, the regions are combined into a single area if the mode of the lock is the same (i.e.; either read permitted or regular lock). If the mode of the overlapping locks differ, the locked areas will be assigned assuming that the most recent request must be satisfied. Thus if a read only lock is applied to a region, or part of a region, that had been previously locked by the same process against both reading and writing, the area of the file specified by the new lock will be locked for read only, while the remaining region, if any, will remain locked against reading and writing. There is no arbitrary limit to the number of regions which may be locked in a file.

Unlock requests may, in whole or part, release one or more locked regions controlled by the process. When regions are not fully released, the remaining areas are still locked by the process. Release of the center section of a locked area requires an additional locked element to hold the separated section. If the lock table is full, an error is returned, and the requested region is not released. Only the process which locked the file region may unlock it. An `unlock` request for a region that the process does not have locked, or that is already unlocked, has no effect. When a process terminates, all locked regions controlled by that process are unlocked.

If a process has done more than one open on a file, all locks put on the file by that process will be released on the first close of the file.

Although no error is returned if locks are applied to special files or pipes, read/write operations on these types of files will ignore the locks. Locks may not be applied to a directory.
SEE ALSO
close(2) creat(2), dup(2), lseek(2), open(2), read(2), write(2)

DIAGNOSTICS
locking returns the value (int)-1 if an error occurs. If any portion of the region has been locked by another process for the LK_LOCK and LK_RLCK actions and the lock request is to test only, errno is set to EAGAIN. If locking the region would cause a deadlock, errno is set to EDEADLK. If an internal lock cannot be allocated, errno is set to ENOLCK.
NAME
mknod - make a directory, or a special or ordinary file

SYNOPSIS
#include <sys/types.h>
#include <osfcn.h>
#include <sys/stat.h>

int mknod (const char *path, mode_t mode, dev_t dev);

DESCRIPTION
mknod creates a new file named by the path name pointed to by path. The file
type and permissions of the new file are initialized from mode.
The file type is specified in mode by the S_IFMT bits, which must be set to one of
the following values:
S_IFIFO  fifo special
S_IFCHR  character special
S_IFDIR  directory
S_IFBLK  block special
S_IFREG  ordinary file
S_IFNAM  name special file

The file access permissions are specified in mode by the 0007777 bits, and may be
constructed by an OR of the following values:
S_ISUID  04000  Set user ID on execution.
S_ISGID  020#0  Set group ID on execution if # is 7, 5, 3, or 1
              Enable mandatory file/record locking if # is 6, 4, 2, or 0
S_ISVTX  01000  Save text image after execution.
S_IRUSR  00400  Read by owner.
S_IWUSR  00200  Write by owner.
S_IXUSR  00100  Execute (search if a directory) by owner.
S_IRWXR  00070  Read, write, execute by group.
S_IREF  00040  Read by group.
S_IWGRP  00020  Write by group.
S_IXGROUP  00010  Execute by group.
S_IREWXR  00007  Read, write, execute (search) by others.
S_IROTH  00004  Read by others.
S_IWOTH  00002  Write by others.
S_IXOTH  00001  Execute by others.

The owner ID of the file is set to the effective user ID of the process. The group
ID of the file is set to the effective group ID of the process. However, if the
S_ISGID bit is set in the parent directory, then the group ID of the file is inherited
from the parent. If the group ID of the new file does not match the effective
group ID or one of the supplementary group IDs, the S_ISGID bit is cleared.

Values of mode other than those above are undefined and should not be used.
The access permission bits of mode are modified by the process's file mode creation mask: all bits set in the process's file mode creation mask are cleared [see umask(2)]. For block and character special files, dev is the special file's device number. For name special files, dev is the file type of the name file, either a
mknod (2)

mknod (2)

XENIX shared data file or a XENIX semaphore. Otherwise, dev is ignored. See mkdev(3C).

mknod may be invoked only by the privileged user for file types other than FIFO special.

mknod fails and creates no new file if one or more of the following are true:

- **EEXIST** The named file exists.
- **EINVAL** Invalid arg value.
- **EFAULT** path points outside the allocated address space of the process.
- **ELOOP** Too many symbolic links were encountered in translating path.
- **EMULTIHOP** Components of path require hopping to multiple remote machines.
- **ENAMETOOLONG** The length of the path argument exceeds \{PATH_MAX\}, or the length of a path component exceeds \{NAME_MAX\} while \(_POSIX_NO_TRUNC\) is in effect.
- **ENOTDIR** A component of the path prefix is not a directory.
- **ENOENT** A component of the path prefix does not exist or is a null pathname.
- **EPERM** The effective user ID of the process is not super-user.
- **EROFS** The directory in which the file is to be created is located on a read-only file system.
- **ENOSPC** No space is available.
- **EINTR** A signal was caught during the mknod system call.
- **ENOLINK** path points to a remote machine and the link to that machine is no longer active.

SEE ALSO

- chmod(2), exec(2), umask(2), mkdev(3C), mkfifo(3C), stat(5).
- creatsem(2), sdget(2) in the BSD/XENIX Compatibility Guide.

DIAGNOSTICS

Upon successful completion a value of 0 is returned. Otherwise, a value of -1 is returned and errno is set to indicate the error.

NOTES

If mknod creates a device in a remote directory using Remote File Sharing, the major and minor device numbers are interpreted by the server.

Semaphore files should be created with the creatsem system call. Shared data files should be created with the sdget system call.
NAME
   nap – suspends execution for a short interval

SYNOPSIS
   cc [flag ...] file ... -lx
   long nap (long period);

DESCRIPTION
   The current process is suspended from execution for at least the number of mil-
   liseconds specified by period, or until a signal is received.

DIAGNOSTICS
   On successful completion, a long integer indicating the number of milliseconds
   actually slept is returned. If the process received a signal while napping, the
   return value will be −1, and errno will be set to EINTR.

SEE ALSO
   sleep(2)

NOTES
   This function is driven by the system clock, which in most cases has a granularity
   of tens of milliseconds.
NAME
  opensem - opens a semaphore

SYNOPSIS
  cc [flag ...] file ... -Ix
  int opensem(int sem_name, char *sem_num);

DESCRIPTION
  opensem opens a semaphore named by sem_name and returns the unique sema-
  phore identification number sem_num used by waitsem and sigsem. creatsem
  should always be called to initialize the semaphore before the first attempt to
  open it.

DIAGNOSTICS
  opensem returns a value of -1 if an error occurs. If the semaphore named does
  not exist, errno is set to ENOENT. If the file specified is not a semaphore file (i.e., a
  file previously created by a process using a call to creatsem), errno is set to ENOT-
  NAM. If the semaphore has become invalid due to inappropriate use, errno is set to
  ENAVAIL.

SEE ALSO
  creatsem(2), sigsem(2), waitsem(2).

WARNING
  It is not advisable to open the same semaphore more than once. Although it is
  possible to do this, it may result in a serious deadlock.
NAME
rdchk - checks to see if there is data to be read

SYNOPSIS
cc [flag ...] file ... -lx
rdchk(int fdes);

DESCRIPTION
rdchk checks to see if a process will block if it attempts to read the file designated by fdes. rdchk returns 1 if there is data to be read or if it is the end of the file (EOF). In this context, the proper sequence of calls using rdchk is:

if(rdchk(fildes) > 0)
    read(fildes, buffer, nbytes);

DIAGNOSTICS
rdchk returns -1 if an error occurs (e.g., EBADF), 0 if the process will block if it issues a read and 1 if it is okay to read. EBADF is returned if a rdchk is done on a semaphore file or if the file specified doesn’t exist.

SEE ALSO
read(2)
NAME
sdenter, sdleave — synchronizes access to a shared data segment.

SYNOPSIS
cc [flag ...] file ... -lx
#include <sys/sd.h>

int sdenter(char *addr, int flags); int sdleave(char *addr);

DESCRIPTION
sdenter is used to indicate that the current process is about to access the contents of a shared data segment. The actions performed depend on the value of flags. flags values are formed by OR-ing together entries from the following list: If another process has called sdenter but not sdleave for the indicated segment, and the segment was not created with the SD_UNLOCK flag set, return an ENAVAIL error instead of waiting for the segment to become free. Indicates that the process wants to write data to the shared data segment. A process that has attached to a shared data segment with the SD_RDONLY flag set will not be allowed to enter with the SD_WRITE flag set. sdleave is used to indicate that the current process is done modifying the contents of a shared data segment.

Only changes made between invocations of sdenter and sdleave are guaranteed to be reflected in other processes. sdenter and sdleave are very fast; consequently, it is recommended that they be called frequently rather than leave sdenter in effect for any period of time. In particular, system calls should be avoided between sdenter and sdleave calls.

The fork system call is forbidden between calls to sdenter and sdleave if the segment was created without the SD_UNLOCK flag.

DIAGNOSTICS
Successful calls return 0. Unsuccessful calls return -1 and errno is set to indicate the error. errno is set to EINVAL if a process does an sdenter with the SD_WRITE flag set and the segment is already attached with the SD_RDONLY flag set. errno is set to ENAVAIL if the SD_NOWAIT flag is set for sdenter and the shared data segment is not free.

SEE ALSO
sdget(2), sdgetv(2).
NAME
sdget, sdfree - attaches and detaches a shared data segment.

SYNOPSIS
cc [flag ...] file ... -lx
#include <sys/sd.h>
char *sdget(char *path, in flags, /* long size, int mode */);
int sdfree(char *addr);

DESCRIPTION
sdget attaches a shared data segment to the data space of the current process. The actions performed are controlled by the value of flags. flags values are constructed by OR-ing flags from the following list: Attach the segment for reading only. Attach the segment for both reading and writing. If the segment named by path exists and is not in use (active), this flag will have the same effect as creating a segment from scratch. Otherwise, the segment is created according to the values of size and mode. Read and write access to the segment is granted to other processes based on the permissions passed in mode, and functions the same as those for regular files. Execute permission is meaningless. The segment is initialized to contain all zeroes. If the segment is created because of this call, the segment will be made so that more than one process can be between sdenter and sdleave calls.

sdfree detaches the current process from the shared data segment that is attached at the specified address. If the current process has done sdenter but not an sdleave for the specified segment, sdleave will be done before detaching the segment.

When no process remains attached to the segment, the contents of that segment disappear, and no process can attach to the segment without creating it by using the SD_CREAT flag in sdget. errno is set to EEXIST if a process tries to create a shared data segment that exists and is in use. errno is set to ENOTNAM if a process attempts an sdget on a file that exists but is not a shared data type.

DIAGNOSTICS
On successful completion, the address at which the segment was attached is returned. Otherwise, -1 is returned, and errno is set to indicate the error. errno is set to EINVAL if a process does an sdget on a shared data segment to which it is already attached. errno is set to EEXIST if a process tries to create a shared data segment that exists and is in use. errno is set to ENOTNAM if a process attempts an sdget on a file that exists but is not a shared data type.

The mode parameter must be included on the first call of the sdget function.

SEE ALSO
sdenter(2), sdgetv(2).
NAME
    sdgetv - synchronizes shared data access.
SYNOPSIS
    cc [flag ...] file ... -lx
    #include <sys/sd.h>
    int sdgetv(addr)
    int sdwaitv(char *addr, int vnum);
DESCRIPTION
    sdgetv and sdwaitv may be used to synchronize cooperating processes that are
    using shared data segments. The return value of both routines is the version
    number of the shared data segment attached to the process at address addr. The
    version number of a segment changes whenever some process does an sdleave
    for that segment.
    sdgetv simply returns the version number of the indicated segment.
    sdwaitv forces the current process to sleep until the version number for the indi­
    cated segment is no longer equal to vnum.
DIAGNOSTICS
    Upon successful completion, both sdgetv and sdwaitv return a positive integer
    that is the current version number for the indicated shared data segment. Other­
    wise, a value of -1 is returned, and errno is set to indicate the error.
SEE ALSO
    sdenter(2), sdget(2).
NAME

sigsem - signals a process waiting on a semaphore.

SYNOPSIS

cc [flag ...] file ... -lx

sigsem(int sem_num);

DESCRIPTION

sigsem signals a process that is waiting on the semaphore sem_num that it may
proceed and use the resource governed by the semaphore. sigsem is used in
conjunction with waitsem to allow synchronization of processes wishing to access
a resource. One or more processes may waitsem on the given semaphore and
will be put to sleep until the process which currently has access to the resource
issues a sigsem call. If there are any waiting processes, sigsem causes the pro­
cess which is next in line on the semaphore's queue to be rescheduled for execu­
tion. The semaphore's queue is organized in First In, First Out (FIFO) order.

DIAGNOSTICS

sigsem returns the value (int) -1 if an error occurs. If sem_num does not refer to
a semaphore type file, errno is set to ENOTNAM. If sem_num has not been previ­
ously opened by opensem, errno is set to EBADF. If the process issuing a sigsem
call is not the current "owner" of the semaphore (i.e., if the process has not
issued a waitsem call before the sigsem), errno is set to ENAVAIL.

SEE ALSO

creatsem(2), opensem(2), waitsem(2).
NAME
stat, lstat, fstat — get file status

SYNOPSIS

#include <sys/types.h>
#include <sys/stat.h>

int stat (const char *path, struct stat *buf);
int lstat (const char *path, struct stat *buf);
int fstat (int fildes, struct stat *buf);

DESCRIPTION

path points to a path name naming a file. Read, write, or execute permission of
the named file is not required, but all directories listed in the path name leading
to the file must be searchable. stat obtains information about the named file.

Note that in a Remote File Sharing environment, the information returned by
stat depends on the user/group mapping set up between the local and remote
computers. [See idload(1M).]

lstat obtains file attributes similar to stat, except when the named file is a sym­
bolic link; in that case lstat returns information about the link, while stat
returns information about the file the link references.

fstat obtains information about an open file known by the file descriptor fildes,
obtained from a successful open, creat, dup, fcntl, or pipe system call.

buf is a pointer to a stat structure into which information is placed concerning
the file.

The contents of the structure pointed to by buf include the following members:

mode_t st_mode; /* File mode [see mknod()] */
ino_t st_ino;  /* Inode number */
dev_t st_dev;  /* ID of device containing */
               /* a directory entry for this file */
dev_t st_rdev; /* ID of device */
               /* This entry is defined only for */
               /* character special files */;
               /* XENIX special named files or block */
               /* special files */

nlink_t st_nlink; /* Number of links */
uid_t st_uid;    /* User ID of the file’s owner */
gid_t st_gid;    /* Group ID of the file’s group */
off_t st_size;   /* File size in bytes */
time_t st_atime; /* Time of last access */
time_t st_mtime; /* Time of last data modification */
time_t st_ctime; /* Time of last file status change */
               /* Times measured in seconds since */
               /* 00:00:00 GMT, Jan. 1, 1970 */
The mode of the file as described in mknod(2).

This field uniquely identifies the file in a given file system. The pair
st_ino and st_dev uniquely identifies regular files.

This field uniquely identifies the file system that contains the file. Its
value may be used as input to the ustat system call to determine
more information about this file system. No other meaning is associ­
ated with this value.

This field should be used only by administrative commands. It is
valid only for block special files or character special files or XENIX spe­
cial named files. The st_rdev field for block special and character spe­
cial files only has meaning on the system where the file was
configured.

If the file is a XENIX special named file, it contains the type code [see
stat(4) for the XENIX semaphore and shared data type code values
S_INSEM and S_INSHD].

This field should be used only by administrative commands.

The user ID of the file’s owner.

The group ID of the file’s group.

For regular files, this is the address of the end of the file. For pipes or
FIFOs, this is the count of the data currently in the file. For block spe­
cial character special, or XENIX special named files. this is not
defined.

Time when file data was last accessed. Changed by the following sys­

tem calls: creat, mknod, pipe, utime, read, creatsem, opensem, sig­
sem, waitsem, sdget and sdfree.

Time when data was last modified. Changed by the following system
calls: creat, mknod, pipe, utime, write.

Time when file status was last changed. Changed by the following
system calls: chmod, chown, creat, link, mknod, pipe, unlink, utime,
write, creatsem, sdget and sdfree.

stat and lstat fail if one or more of the following are true:

EACCES Search permission is denied for a component of the path
prefix.

EBADF fd is not a valid open file descriptor.

EFAULT buf or path points to an invalid address.

EINVAL A signal was caught during the stat system call.

ELOOP Too many symbolic links were encountered in translating
path.
Components of *path* require hopping to multiple remote machines.

The length of the *path* argument exceeds `{PATH_MAX}`, or the length of a *path* component exceeds `{NAME_MAX}` while `{_POSIX_NO_TRUNC}` is in effect.

The named file does not exist or is the null pathname.

A component of the path prefix is not a directory.

*path* points to a remote machine and the link to that machine is no longer active.

A component is too large to store in the structure pointed to by *buf*.

*fstat* fails if one or more of the following are true:

- ENOLINK: *fildes* points to a remote machine and the link to that machine is no longer active.
- EOVERFLOW: A component is too large to store in the structure pointed to by *buf*.

### SEE ALSO

- chmod(2), chown(2), creat(2), link(2), mknod(2), pipe(2), read(2), time(2), unlink(2), utime(2), write(2), stat(5).

### DIAGNOSTICS

Upon successful completion a value of 0 is returned. Otherwise, a value of -1 is returned and *errno* is set to indicate the error.
waitsem(2)

NAME
waitsem, nbwaitsem - awaits and checks access to a resource governed by a
semaphore.

SYNOPSIS
cc [flag ...] file ... -lx
waitsem(int sem_num);
nbwaitsem(int sem_num);

DESCRIPTION
waitsem gives the calling process access to the resource governed by the sema-
phore sem_num. If the resource is in use by another process, waitsem will put
the process to sleep until the resource becomes available; nbwaitsem will return
the error ENAVAIL. waitsem and nbwaitsem are used in conjunction with sigsem
to allow synchronization of processes waiting to access a resource. One or more
processes may waitsem on the given semaphore and will be put to sleep until the
process which currently has access to the resource issues sigsem. sigsem causes
the process which is next in line on the semaphore's queue to be rescheduled for
execution. The semaphore's queue is organized in First In, First Out (FIFO)
order.

DIAGNOSTICS
waitsem returns the value (int) -1 if an error occurs. If sem_num has not been
previously opened by a call to opensem or creatsem, errno is set to EBADF. If
sem_num does not refer to a semaphore type file, errno is set to ENOTNAM. All
processes waiting (or attempting to wait) on the semaphore return with errno set
to ENAVAIL when the process controlling the semaphore exits without relinquish-
ing control (thereby leaving the resource in an undeterminate state). If a process
does two waitsems in a row without doing an intervening sigsem, errno is set to
EINVAL.

SEE ALSO
opensem(2), creatsem(2).
NAME
stat - data returned by stat system call

SYNOPSIS
#include <sys/types.h>
#include <sys/stat.h>

DESCRIPTION
The system calls stat, lstat and fstat return data in a stat structure, which is
defined in stat.h:

```c
struct stat {
    dev_t st_dev;
    ino_t st_ino;
    mode_t st_mode;
    nlink_t st_nlink;
    uid_t st_uid;
    gid_t st_gid;
    dev_t st_rdev;
    off_t st_size;
    time_t st_atime;
    time_t st_mtime;
    time_t st_ctime;
};
```

The constants used in the st_mode field are also defined in this file:

```c
#define S_IFMT 0xF000 /* type of file */
#define S_IFMPT 0x2000 /* character special */
#define S_IFCHR 0x10000 /* directory */
#define S_IFDIR 0x50000 /* XENIX special named file */
#define S_IFNAM 0x20000 /* XENIX semaphore subtype of IFNAM */
#define S_IFSEM 0x10000 /* XENIX shared data subtype of IFNAM */
#define S_IFBLK 0x4000 /* block special */
#define S_IFREG 0x8000 /* regular */
#define S_IFLINK 0xA000 /* symbolic link */
#define S_ISUID 0x0400 /* set user id on execution */
#define S_ISGID 0x0200 /* set group id on execution */
#define S_ISVTX 0x0100 /* save swapped text even after use */
#define S_IRUSR 0x0040 /* read permission, owner */
#define S_IWUSR 0x0020 /* write permission, owner */
#define S_IXUSR 0x0010 /* execute/search permission, owner */
#define S_ISMFT 0x0010 /* record locking enforcement flag */
#define S_IREAD 0x0008 /* read, write, execute: owner */
#define S_IWRITE 0x0004 /* read permission: owner */
#define S_IEXEC 0x0001 /* execute/search permission: owner */
#define S_IREAD 0x0008 /* write permission: owner */
#define S_IWRITE 0x0004 /* read permission: owner */
#define S_IXUSR 0x0010 /* execute permission: owner */
```
```c
#define S_IRWXG 00070 /* read, write, execute: group */
#define S_IRGRP 00040 /* read permission: group */
#define S_IWGRP 00020 /* write permission: group */
#define S_IXGRP 00010 /* execute permission: group */
#define S_IRWXO 00007 /* read, write, execute: other */
#define S_IROTH 00004 /* read permission: other */
#define S_IWOTH 00002 /* write permission: other */
#define S_IXOTH 00001 /* execute permission: other */
```

SEE ALSO
stat(2), types(5).
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